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ABSTRACT

The 1987-88 Schools and Staffing Survey (SASS) looked at a national sample of elementary and secondary public and private schools. Components of the SASS, a data collection effort of the National Center for Education Statistics, were surveys of teacher demand and shortage, schools, administrators, and teachers. Approximately 13,000 schools and administrators, 65,000 teachers, and 5,600 local education agencies composed the SASS sample. This study was conducted to develop generalized variance functions that could be used to approximate the sampling error associated with an estimate of interest from the SASS. These generalized variances were designed for the user who does not have half-sample replication software available, but requires an approximation to the sampling error associated with his or her estimates of interest. A generalized variance function is a mathematical model describing the relationship between the variance or relative variance of a survey estimator and its expectation. The method for determining the generalized variance functions was tested in a pilot test, and generalized variance functions were then developed. The first appendix presents summary pilot test results, and the second contains tables of the generalized variance functions for the different survey components. (Contains 9 figures and 15 tables.) (SLD)

NATIONAL CENTER FOR EDUCATION STATISTICS

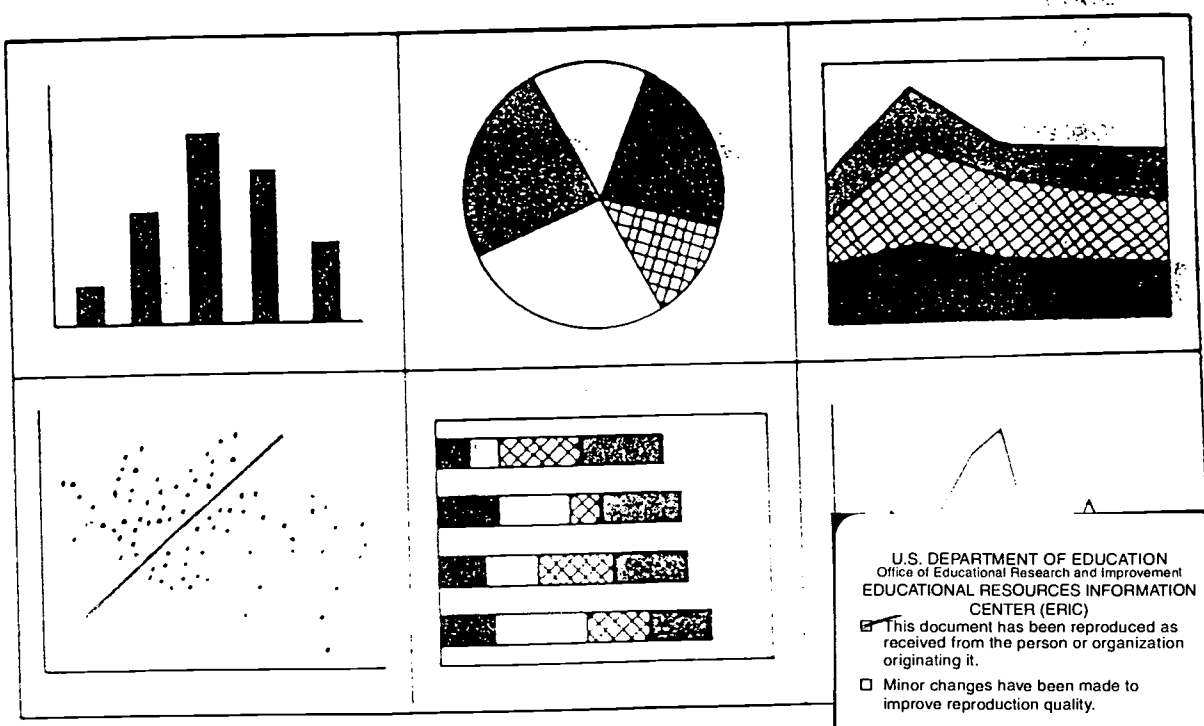
Working Paper Series

Generalized Variance Estimate for

Schools and Staffing Survey (SASS)

Working Paper No. 94-02

July 1994



U.S. Department of Education
Office of Educational Research and Improvement

Generalized Variance Estimate for

Schools and Staffing Survey (SASS)

Working Paper No. 94-02 July 1994

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July 1994

Foreword

Each year a large number of written documents are generated by NCES staff and individuals commissioned by NCES which provide preliminary analyses of survey results and address technical, methodological, and evaluation issues. Even though they are not formally published, these documents reflect a tremendous amount of unique expertise, knowledge, and experience.

The ***Working Paper Series*** was created in order to preserve the valuable information contained in these documents and to promote the sharing of valuable work experience and knowledge. However, these documents were prepared under different formats and did not undergo vigorous NCES publication review and editing prior to their inclusion in the series. Consequently, we encourage users of the series to consult the individual authors for citations.

To receive information about submitting manuscripts or obtaining copies of the series, please contact Suellen Mauchamer at (202) 219-1828 or U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, 555 New Jersey Ave., N.W., Room 400, Washington, D.C. 20208-5652.

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GENERALIZED VARIANCE ESTIMATES FOR SASS

Final Report

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Table of Contents

SECTION	PAGE
Foreword	iii
Table of Contents	iv
Introduction	1
Method of Generalizing Variances	2
Technical Approach	5
References	10

APPENDICES

Appendix I: Summary Pilot Test Results	11
Appendix II: Generalized Variance Functions	30

EARLIER SUBMISSION (June 1992)

15 volumes containing results of exploratory analysis

I. Introduction

This study looked at the data gathered during the 1987-88 Schools and Staffing Survey (SASS) which was a national survey of elementary and secondary schools. The target populations for the SASS were school administrators (principals and heads), and classroom teachers in public and private elementary/secondary schools. The survey design consisted of two parallel but essentially separate schemes, one for the public schools and one for private (nonpublic) schools. The components of SASS were (1) Survey of Teacher Demand and Shortage (TDS), (2) Survey of Schools (3) Survey of School Administrators, and (4) Teacher Survey. Approximately 13,000 schools and administrators, 65,000 teachers, and 5,600 Local Education Agencies (LEA's) composed the SASS sample.

NCES prepared eight SASS data files corresponding to the four types of surveys of both public and private schools, each of which contains a set of 48 replicate weights. These weights were designed to produce variances using balanced half-sample variance estimation. However, these replicate weights can be utilized only by users who have half-sample replication software available. The purpose of this task is to develop and test a new procedure using generalized variance functions for approximating the sampling error associated with an estimate of interest.

There were a large number of estimates of interest for the SASS. Estimates of proportions, totals and averages at the national level for various subdomains (i.e., region, school level, minority status, school size, community status and combinations of these) were made. Examples include (1) the total number of administrators who earned a bachelors degree, (2) the proportion of Hispanic students (regardless of race) (3) the number of FTE teachers, and (4) the average hours of teaching basic subjects in private schools.

The school sample was a single stage sample stratified by state by school level in public schools, and state by affiliation by school level in private school. Schools were systematically selected using a probability proportionate to size (pps) algorithm.

Within the first stage school sample, a second stage teacher sample was selected stratified by teacher experience level (teachers with three or fewer years of experience were classified into the new teacher stratum, and all other teachers were classified into the experienced teacher stratum). Within a school, teachers were selected systematically with equal probability.

The goal of this task was to produce generalized variance functions for each of the Schools and Staffing Surveys (SASS). The generalized variances were designed for the user who does not have half-sample replication software available, but requires an approximation to the sampling error associated with his/her estimates of interest.

II. Method of Generalizing Variances

A generalized variance function (GVF) is a mathematical model describing the relationship between the variance or relative variance (relvariance) of a survey estimator and its expectation. If the parameters of the model can be estimated from past data or from a small subset of the survey items, then variance estimates can be produced for all survey items by evaluating the model at the survey estimates, rather than by direct computations.

Denote the estimator of a certain attribute of interest as Xhat and let X = E{Xhat} denote its expectation. Then the relvariance can be expressed as follows:

$$V^2 = \mathrm{Var}(\mathrm{Xhat})/X^2$$

Most of the GVFs to be considered are based on the premise that the relative variance is a decreasing function of the magnitude of the expectation X.

A simple model which exhibits this property is:

$$V^2 = A + B/X, \qquad \text{with } B > 0. \qquad \text{(Model 1)}$$

The parameters A and B are unknown and to be estimated. Experience has shown that Model 1 often provides an adequate description of the relationship between V^2 and X. In fact, the Census Bureau has used this model for its Current Population Survey since 1947.

However, in an attempt to achieve an even better fit to the data than is possible with Model 1, the following are alternative forms of relvariance models which may be considered

$$V^2 = A + B/X + C/X^2 \qquad \text{(Model 2)}$$

$$\log(V^2) = A + B \log(X) \qquad \text{(Model 3)}$$

$$V^2 = (A + BX)^{-1} \qquad \text{(Model 4)}$$

$$V^2 = (A + BX + CX^2)^{-1} \qquad \text{(Model 5)}$$

where

V^2 = Relative variance

X = Expectation of the selected survey estimate

A,B,C = Unknown parameters to be estimated

Unfortunately, there is very little theoretical justification for any of the models discussed above. There is some limited justification for Model 1 (Wolter (1985)), and this is summarized in the following paragraphs:

1. Suppose that the population is composed of N clusters, each of size M. A simple random sample of n clusters is selected, and each elementary unit in the selected clusters is enumerated. Then, the variance of the Horvitz-Thompson estimator Xhat of the population total X is

$$\sigma^2=(NM)^2\frac{N-n}{N-1}\frac{PQ}{nM}[1+(M-1)\rho]$$

where P = X/NM is the population mean per element, Q = 1 - P and ρ denotes the intraclass correlation between pairs of elements in the same cluster. The relative variance of Xhat is

$$V^2=\frac{N-n}{N-1}\frac{Q}{P(nM)}[1+(M-1)\rho]$$

and assuming that the first stage sampling fraction is negligible, we may write

$$V^2=\frac{1}{X}\frac{NM[1+(M-1)\rho]}{nM}-\frac{[1+(M-1)\rho]}{nM}.$$

Thus, for this simple sampling scheme and estimator, Model 1 provides an acceptable model for relating V^2 to X. If the value of the intraclass correlation is constant (or approximately so) for a certain class of survey estimates, then Model 1 may be useful for estimating the variances in the class.

2. Kish (1967) and others have popularized the notion of *design effects*. If we assume an arbitrary sampling design leading to a sample of n units from a population of size N, then the design effect for Xhat is defined by

$$Deff = \sigma^2/(N^2PQ/n),$$

where P = X/N and Q = 1 - P. This is the variance of Xhat given the true sampling design divided by the variance given simple random sampling. Thus, the relative variance may be expressed by

$$V^2 = Q(Pn)^{-1}Deff$$

$$= -Deff/n + (N/n)Deff/X.$$

Assuming that Deff may be considered independent of the magnitude of X within a given class of survey statistics, the relvariance above is of the form of Model 1 and may be useful for estimating variances in the class.

3. Suppose that it is desired to estimate the proportion R=X/Y, where Y is the total number of individuals in a certain subpopulation and X is the number of those individuals with a certain attribute. If Xhat and Yhat denote estimators of X and Y, respectively, then the natural estimator of R is Rhat = Xhat/Yhat. Utilizing a Taylor series approximation and assuming Yhat and Rhat are uncorrelated, we may write

$$V_R^2 \doteq V_X^2 - V_Y^2,$$

where V^2_R, V^2_X, and V^2_Y denote the relative variances of Rhat, Xhat, and Yhat, respectively. If Model 1 holds for both V^2_X and V^2_Y, then V^2_R above gives

$$V_R^2 \doteq \beta/X - \beta/Y$$

$$= \frac{\beta}{Y}\frac{(1 - R)}{R}.$$

and hence

$$Var(Rhat) \doteq (\beta/Y)R(1 - R).$$

The above equation for Var(Rhat) has the important property that the variance of an estimator

$$\acute{Rhat} = \acute{Xhat}/Yhat$$

of a proportion

$$\acute{R} = \acute{X}/Y$$

which satisfies

$$\acute{R} = 1 - R$$

is identical to the variance of the estimator Rhat of R. Thus, for example, Var(Rhat) = Var(1 - Rhat). Model 1 can be justified on the basis that it is the only known model that possesses this important property.

III. Technical Approach

As a first step, a pilot test was conducted and based on the pilot test conclusions an exploratory analysis procedure was determined. The findings from the exploratory analysis determined which fitted model was to be used as the GVF.

a. Pilot Test

Step 1: Direct estimates of totals for selected student and teacher headcount variables from the School and the Teacher Demand and Shortage surveys at the national level (by sector and community type) were calculated. These estimates were chosen as a provisional group of similar items to be used for model estimation. A direct calculation of the variance of each of the totals using a balanced half-sample replication technique was used to derive the relvariance and the coefficient of variation (CV). Scatter plots of the log of the estimate versus the log of the CV were used to form "final" groups of statistics that followed a common model. These final groups were formed by simply removing from the provisional group those statistics that appeared to follow a different model than the majority of statistics in the group, and added other statistics, originally outside the provisional group, that appeared consonant with the group model.

As noted in Section II, there is no rigorous theoretical justification for any of the models that relate V^2 to X. Because we were unable to be quite specific about any of the models and their attending assumptions, it was not possible to construct, or even to contemplate, optimum estimators of the model parameters. Discussions of optimality would require an exact model and an exact statement of the error structure of the estimator $Vhat^2$ and Xhat. In the absence of a completely specified model, we attempted to achieve a good empirical fit to the data (Xhat, $Vhat^2$) as we considered alternative fitting methodologies.

Step 2: Using the calculated estimates and their CV's, un-weighted nonlinear models using SAS NLIN procedure were fit in order to produce least-squares estimates of the parameters of all five of the relvariance models described in section II above for each of the six subdomains groups (made up of combinations of public/private and urban/suburban/rural). The iterative method specified for the NLIN procedure was the modified Gauss-Newton method which regresses the residuals onto the partial derivatives of the model with respect to the parameters until the estimates converge.

Step 3: The results of the NLIN runs were summarized in terms of the RMSE and bias by quartile.

Step 4: An overlay of the scatterplot of the CV's versus the log of the estimate onto the fitted regression curve was plotted for each of the fitted models described in step 2.

Step 5: Finally, the results of steps 3 and step 4 were examined to help determine a viable subset of models to be used for the overall analysis. This determination was made by looking at both how well the data fit the model and how well the shape of the curve was in accord with reality.

Preliminary Results:

Refer to Appendix I for a representative example of the plots for each of the models used in the pilot test and a summary of relevant results.

Both models 2 and 5 produced inappropriate shapes for the regression curve fit to the data in terms of a danger that extrapolation could lead to a result that was far from in accord with reality. Of the remaining models (1, 3 and 4), model 1 was the worst because the shape of the regression curve often dropped off too fast and leveled off too quickly. The shape of the curve for Model 3 seemed reasonable and appeared to fit fairly well overall, but had a higher RMSE than model 4. Also, model 3 resulted in a conservative (but possibly very large) predicted CV for small estimates. Model 4 had the best overall RMSE, largely due to a downward curvature on the left side of the regression curve. Model 4 also resulted in a possible bias (understatement) of CV's for large estimates.

Preliminary Conclusions

Models 2 and 5 were to be excluded from any further analysis based on the inappropriate shape of the regression curve fit to the data. More data would be needed for small estimates to choose between models 3 and 4. Model 1 would be included for further analysis because it is the only model with limited theoretical justification. It was therefore decided to fit all three viable models (models 1, 3 and 4) using three alternative fitting methodologies: unweighted, weighted, and iteratively reweighted non-linear regression approach.

b. Exploratory Analysis

Step 1: The following lists the types of estimates (percentages, totals and averages) for selected variables from each of the four SASS data sets (School, School Administrator, Teacher, Teacher Demand & Shortage (TDS)) for various subdomains (i.e., region, state, school level, minority status, school size, community status and combinations of these) that were calculated. Due to time constraints, percentages for the School and TDS surveys were not included in this analysis.

The School Survey

-- student totals
-- teacher totals
-- averages

The Teacher Demand & Shortage Survey

-- student totals
-- teacher totals
-- averages

The School Administrator Survey

-- administrator percentages
-- administrator totals
-- averages

The Teacher Survey

-- teacher percentages
-- teacher totals

and **salary averages** for both the administrators and teachers.

Step 2: CV's for the estimates in step 1 were calculated using balanced half-sample replication techniques. Plots of the log of the estimate versus the log of the CV were used to finalize groups to be used for model estimation.

Step 3: Using the calculated estimates in each of the subdomain groups from step 1 and their respective CV's from step 2, nonlinear models using SAS NLIN procedure were fit in order to produce ordinary least-squares (OLS), weighted least squares (WLS), and iteratively re-weighted least squares (IRLS) estimates of the parameters and respective R-squared

values for each of the relvariance models 1, 3 and 4 described in section II. The WLS procedure was specified to work with the sum of squares which weighted inversely to the square of the observed CV and the IRLS method was specified to work with the sum of squares which weighted inversely to the square of the predicted CV. The minimizing values from the OLS technique were used as starting values in the WLS and IRLS runs. A plot of the regression curve fit for each of the three methods (OLS, WLS, IRLS) of fitting a model was used to determine which method for fitting the model worked best. Based on these plots, the IRLS technique of model fitting proved to be best. The OLS technique gave too much weight to the small estimates whose corresponding relvariance was usually large and unstable and the WLS technique was a better procedure because it gave the least reliable terms in the sum of the squares a reduced weight, but the IRLS technique fit most of the data better than either of the other two techniques. A plot showing the R^2 values of one model versus another model was used to determine which GVF model fit best. (See separate volumes for the above mentioned plots).

Step 4: An out of sample test was performed to validate conclusions made from step 3.

NOTE: **15 volumes containing the results of the above steps were submitted to NCES in June, 1992. These volumes contained regression curve plots, R^2, summary R^2, and a list of selected variables.**

Findings: The following are the selected IRLS models within each survey based on the exploratory analysis:

-- **The School Survey**

Student Totals	- GVF Model 3 was selected
Teacher Totals	- GVF Model 3 was selected
Averages	- GVF Model 1 was selected

-- **The TDS Survey**

Student Totals	- GVF Model 1 was selected
Teacher Totals	- GVF Model 1 was selected
Averages	- GVF Model 3 was selected

-- **The School Administrator Survey**

Administrator Percentages	- GVF Model 1 was selected
Administrator Totals	- GVF Model 1 was selected
Averages	- GVF Model 3 was selected

--	**The Teacher Survey**	
	Teacher Percentages	- GVF Model 1 was selected GVF
	Teacher Totals	- GVF Model 1 was selected GVF
--	**Salary Averages**	- GVF Model 3 was selected

IV. GVF Tables and Their Use

GVFs were developed to allow for the calculation of the approximate variance of some totals, percentages and averages of interest in the SASS surveys. Instead of providing individual standard error tables for each characteristic of interest, generalized standard error tables for estimated totals, percentage, and averages, by various subdomains, are provided in the tables in Appendix II.

Illustration of the Use of GVF Tables--

Table 1 below is an extract of the *TDS Survey-GVFs for Teacher Totals* table from Appendix II. This table gives the coefficients used to calculate the generalized CV of a teacher total from the TDS Survey using the following GVF:

$$CV = \sqrt{A + B/X}$$

For example, the estimate of public school teachers is 2,323,204 and the generalized CV is calculated using the coefficients in the row labeled "Public" in Table 1 as

$$\text{sqrt}\{\mathbf{0.0000143934} + (\mathbf{27.7967357150} / 2{,}323{,}204)\} = 0.0051248$$

or the standard error would be 11906.24 (i.e, 0.0051248 x 2,323,204).

Table 1
THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

SECTOR			
Public	**0.0000143934**	**27.7965357150**	0.6004
Private	0.0006029196	55.7521276750	0.6428
REGION			
Northeast	0.0000958215	44.0211866660	0.5344
NorthCentral	0.0001351847	39.0908062800	0.5193
South	0.0000076371	42.4849125630	0.6801
West	0.0000542048	25.9695570480	0.5240

Standard Error of a Ratio

To estimate the relative variance of an estimated ratio, R = X/Y, where Y is an estimator of the total number of individuals in a certain subpopulation and X is an estimator of the number of individuals in another subpopulation, use

$$V^2_R = V^2_X - V^2_Y$$

where the relvariances of X and Y are read from the appropriate GVF table in Appendix II. This formula has been shown to produce useful approximations. The approximation is appropriate when the correlation between the ratio X/Y and the denominator Y is close to 0; the approximation is an overestimate if the correlation is positive.

V. References

Kish, L. (1967). *Survey Sampling*. New York: John Wiley and Sons.

U.S. Bureau of the Census (1978). Technical Paper 40 - *The Current Population Survey - Design and Methodology*, U.S. Government Printing Office, Washington, D.C. 20402.

Wolter, K. M. (1985). *Introduction to Variance Estimation*. New York: Springer Verlag.

APPENDIX I

SUMMARY OF PILOT TEST RESULTS

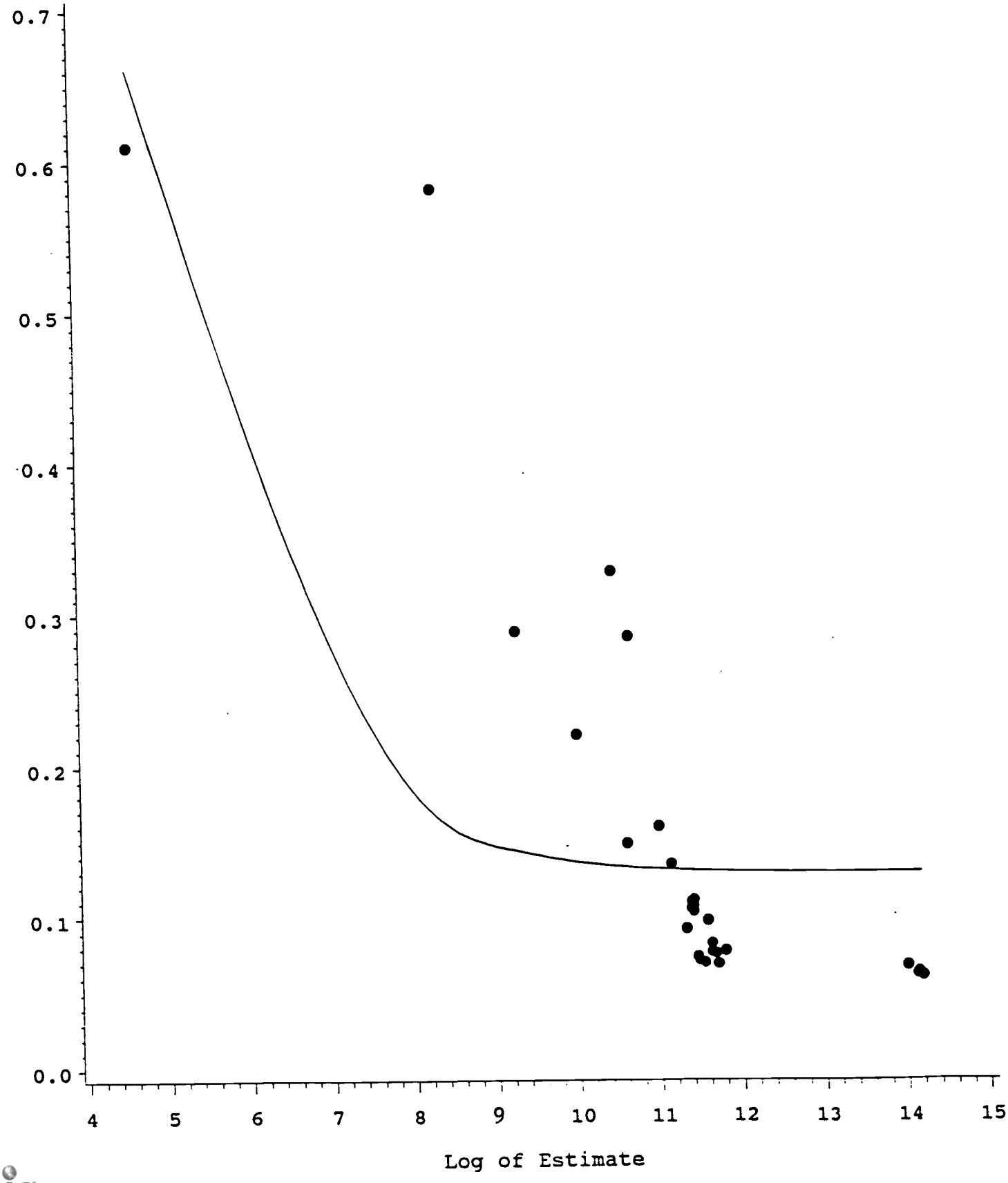
This appendix provides examples representative of the following preliminary conclusions drawn from the pilot test:

- **Model 1**:
  - -- Worst of the three viable models
  - -- Often drops off too fast and levels too quickly.
- **Model 2**:
  - -- Inappropriate shape.
- **Model 3**:
  - -- Appears to fit fairly well overall, but higher RMSE than Model 4.
  - -- Conservative (but possibly very large) predicted CV for small estimates.
- **Model 4**:
  - -- Best overall RSME, largely due to downward curvature on left side.
  - -- Possible bias (understatement) of CVs for large estimates.
- **Model 5**:
  - -- Inappropriate shape.

EXAMPLE OF FIT FOR THE FIVE MODELS

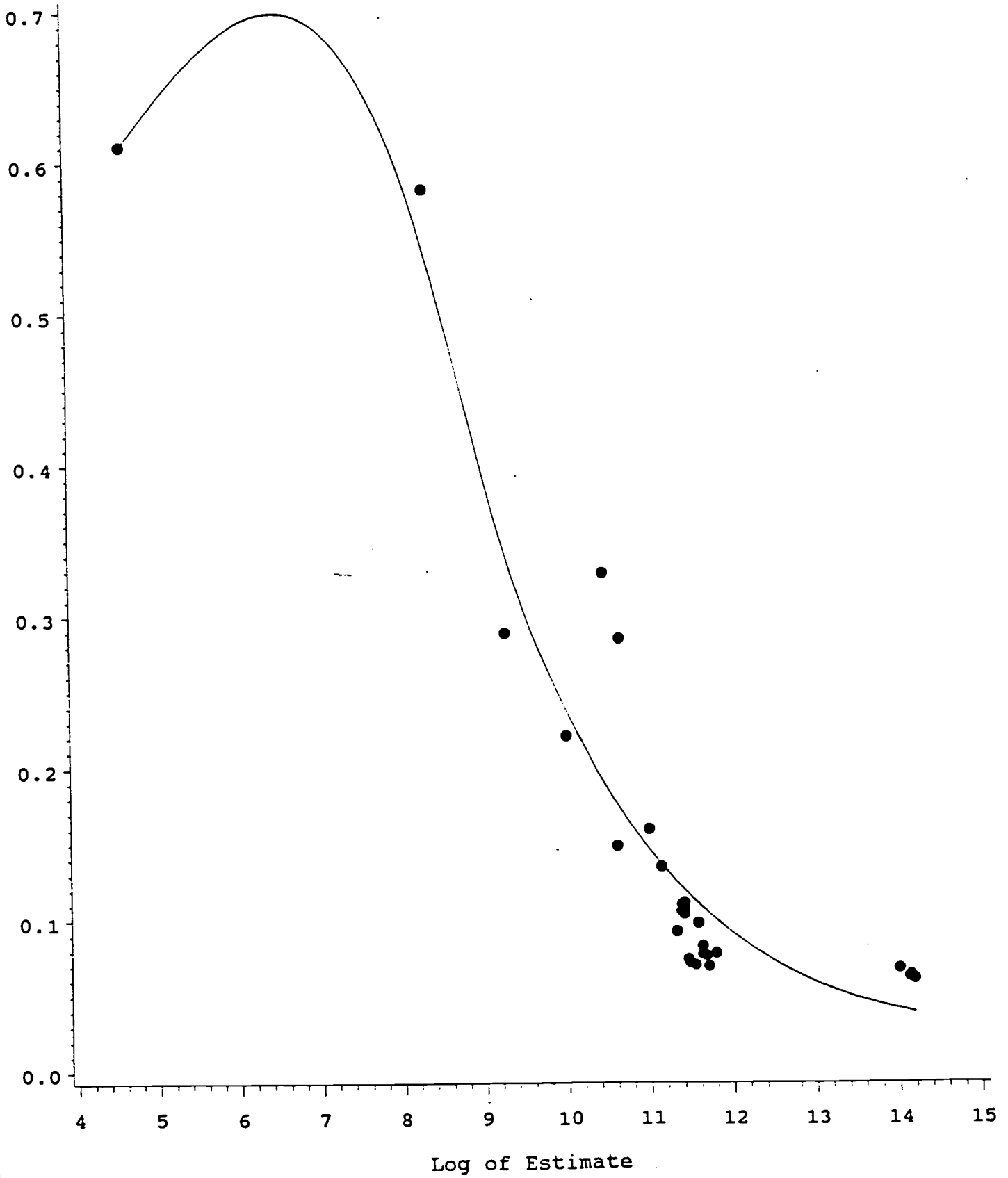
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PRIVATE CATEGORY=# STUDENTS MODEL=MODEL 1



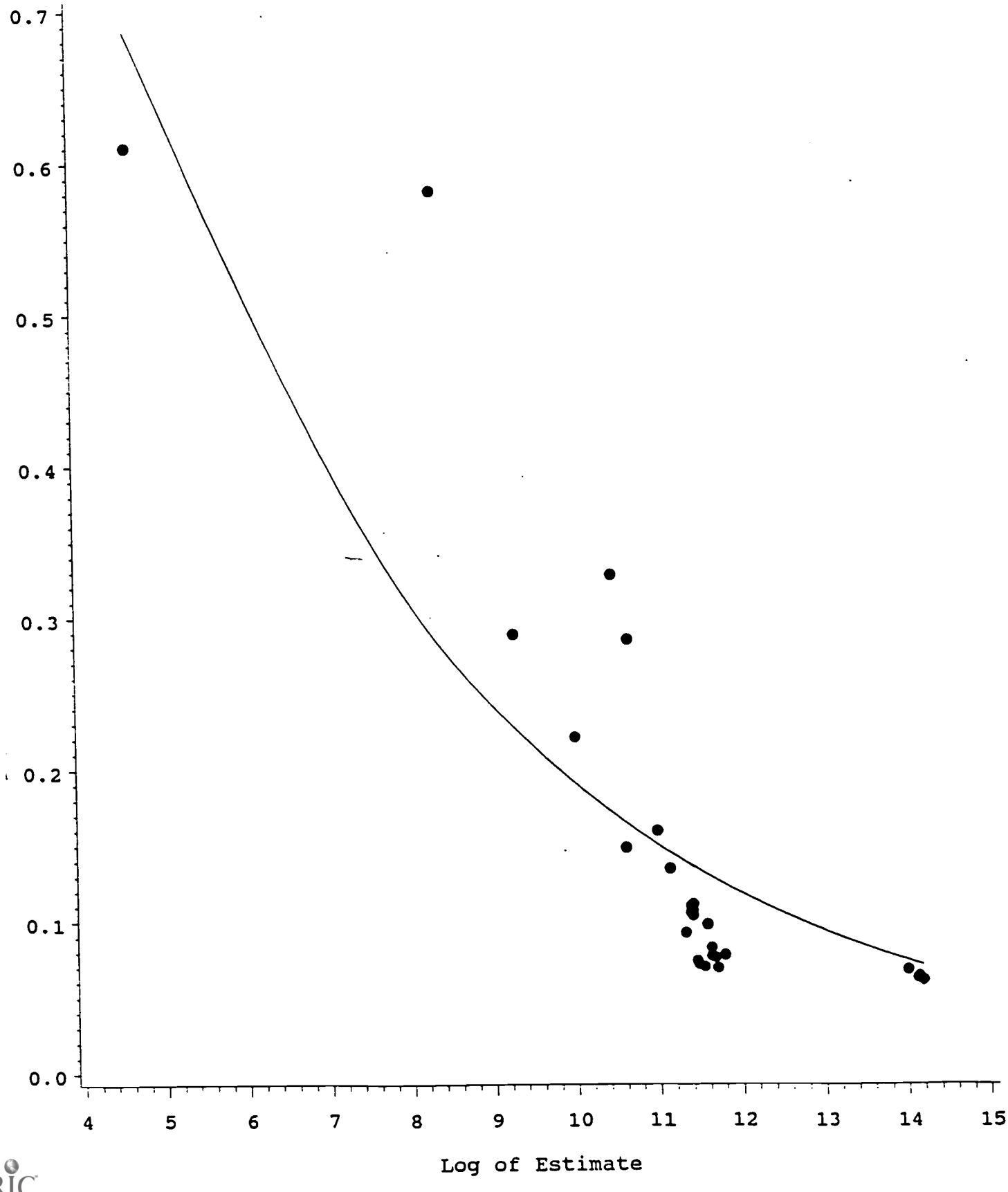
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PRIVATE CATEGORY=# STUDENTS MODEL=MODEL 2



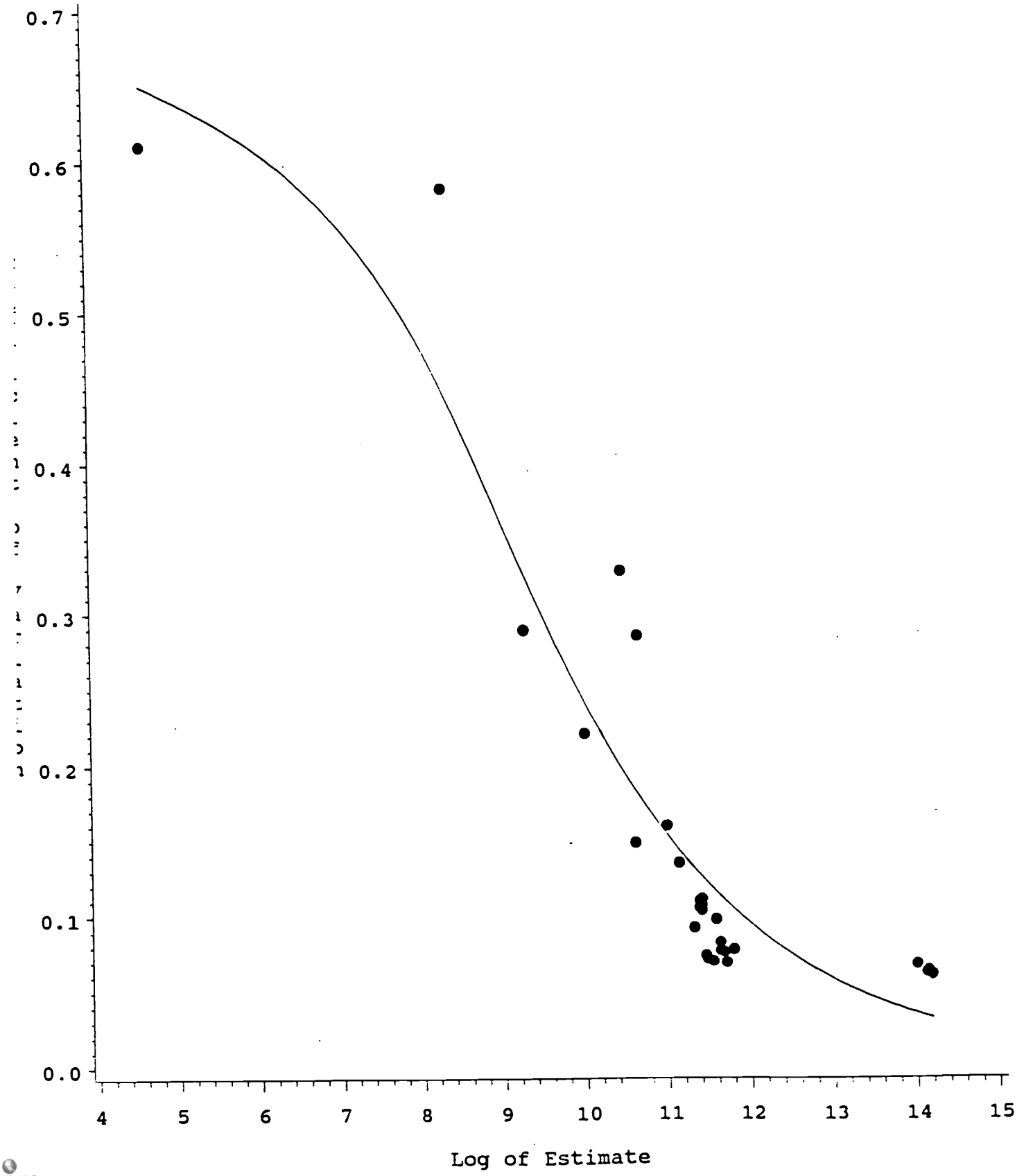
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PRIVATE CATEGORY=# STUDENTS MODEL=MODEL 3



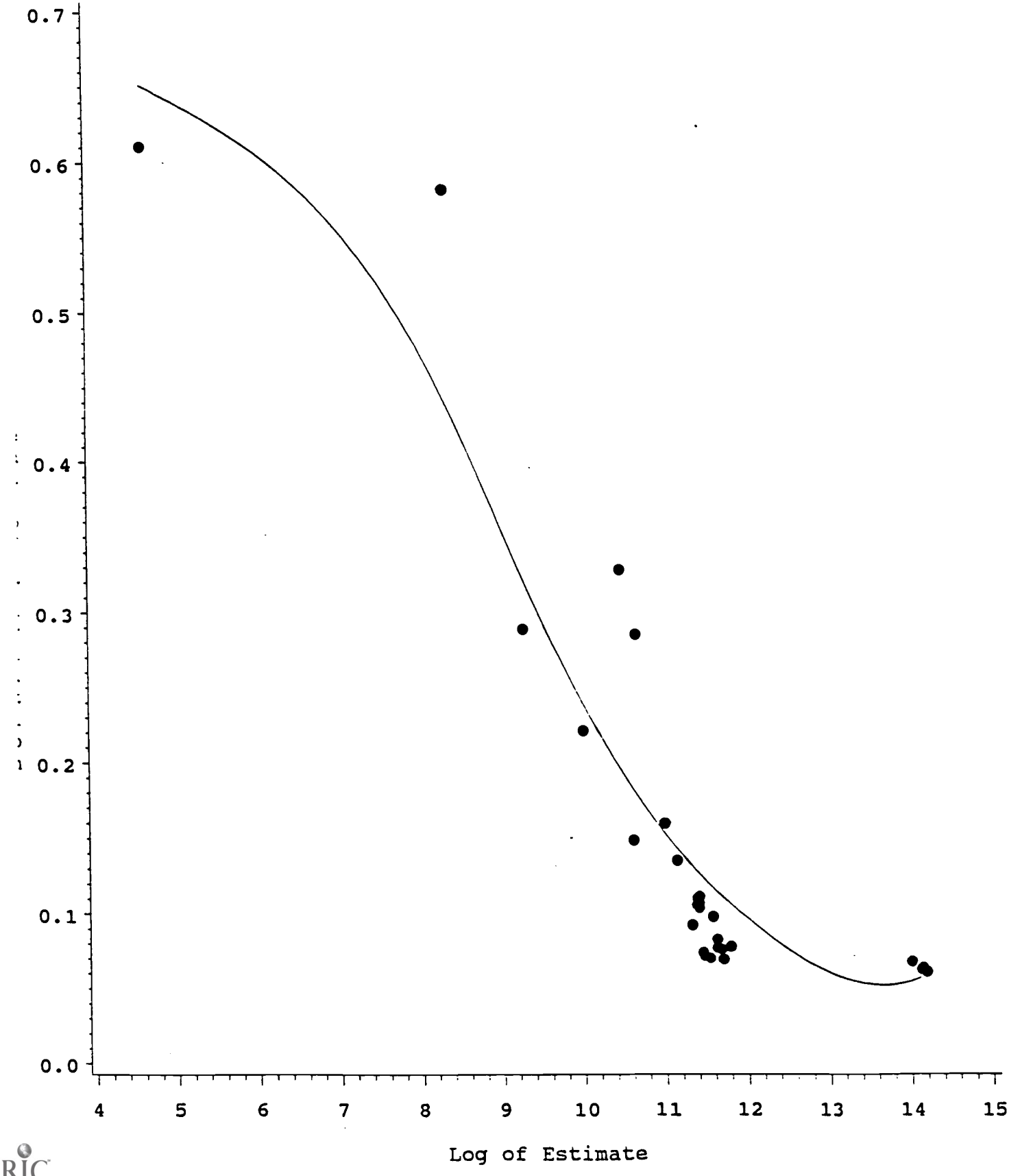
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PRIVATE CATEGORY=# STUDENTS MODEL=MODEL 4



Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PRIVATE CATEGORY=# STUDENTS MODEL=MODEL 5



SUMMARY OF RMSE AND QUARTILE BIAS RESULTS

SUMMARY OF RMSE

MODEL	RMSE	AVG ACTUAL CV
MODEL 1	0.047088	0.37785
MODEL 2	0.032420	0.37785
MODEL 3	0.039917	0.37785
MODEL 4	0.034638	0.37785
MODEL 5	0.033603	0.37785

SUMMARY OF QUARTILE BIAS

MODEL	Q1_BIAS	Q2_BIAS	Q3_BIAS	Q4_BIAS
MODEL 1	0.01705	0.00818	-0.00247	-0.03342
MODEL 2	0.00340	0.00340	0.00183	-0.00767
MODEL 3	0.00339	0.00954	0.00864	-0.01532
MODEL 4	-0.00981	-0.00143	0.00335	-0.00681
MODEL 5	-0.00396	-0.00336	0.00042	-0.00703

MODEL	Q1_AVG	Q2_AVG	Q3_AVG	Q4_AVG
ACTUAL CV	0.03453	0.04604	0.06574	0.18055

DETAILS OF RMSE FOR MODELS 1, 3 & AND ILLUSTRATIVE EXAMPLE PLOTS

DETAILS OF RMSE FOR MODELS 1, 3 & 4
PAGE 1 OF 2

ILE	SCH_TYPE	CATEGORY	MODEL	RMSE	AVG_CV
HOOLS	RURAL/PRIVATE	# STUDENTS	MODEL 1	0.09949	0.83911
HOOLS	RURAL/PRIVATE	# STUDENTS	MODEL 3	0.07755	0.83911
HOOLS	RURAL/PRIVATE	# STUDENTS	MODEL 4	0.06072	0.83911
HOOLS	RURAL/PRIVATE	# TEACHERS	MODEL 1	0.09364	0.54041
HOOLS	RURAL/PRIVATE	# TEACHERS	MODEL 3	0.08088	0.54041
HOOLS	RURAL/PRIVATE	# TEACHERS	MODEL 4	0.07691	0.54041
HOOLS	RURAL/PUBLIC	# STUDENTS	MODEL 1	0.03290	0.40879
HOOLS	RURAL/PUBLIC	# STUDENTS	MODEL 3	0.02791	0.40879
HOOLS	RURAL/PUBLIC	# STUDENTS	MODEL 4	0.01782	0.40879
HOOLS	RURAL/PUBLIC	# TEACHERS	MODEL 1	0.02224	0.14778
HOOLS	RURAL/PUBLIC	# TEACHERS	MODEL 3	0.01957	0.14778
HOOLS	RURAL/PUBLIC	# TEACHERS	MODEL 4	0.01933	0.14778
HOOLS	SUBURBAN/PRIVATE	# STUDENTS	MODEL 1	0.10452	0.61063
HOOLS	SUBURBAN/PRIVATE	# STUDENTS	MODEL 3	0.07740	0.61063
HOOLS	SUBURBAN/PRIVATE	# STUDENTS	MODEL 4	0.05039	0.61063
HOOLS	SUBURBAN/PRIVATE	# TEACHERS	MODEL 1	0.06543	0.68905
HOOLS	SUBURBAN/PRIVATE	# TEACHERS	MODEL 3	0.06731	0.68905
HOOLS	SUBURBAN/PRIVATE	# TEACHERS	MODEL 4	0.06904	0.68905
HOOLS	SUBURBAN/PUBLIC	# STUDENTS	MODEL 1	0.05805	0.55560
HOOLS	SUBURBAN/PUBLIC	# STUDENTS	MODEL 3	0.04255	0.55560
HOOLS	SUBURBAN/PUBLIC	# STUDENTS	MODEL 4	0.02608	0.55560
HOOLS	SUBURBAN/PUBLIC	# TEACHERS	MODEL 1	0.03698	0.23775
HOOLS	SUBURBAN/PUBLIC	# TEACHERS	MODEL 3	0.03170	0.23775
HOOLS	SUBURBAN/PUBLIC	# TEACHERS	MODEL 4	0.03082	0.23775
HOOLS	URBAN/PRIVATE	# STUDENTS	MODEL 1	0.05293	0.50000
HOOLS	URBAN/PRIVATE	# STUDENTS	MODEL 3	0.03765	0.50000
HOOLS	URBAN/PRIVATE	# STUDENTS	MODEL 4	0.04805	0.50000
HOOLS	URBAN/PRIVATE	# TEACHERS	MODEL 1	0.04465	0.32151
HOOLS	URBAN/PRIVATE	# TEACHERS	MODEL 3	0.03984	0.32151
HOOLS	URBAN/PRIVATE	# TEACHERS	MODEL 4	0.04163	0.32151
HOOLS	URBAN/PUBLIC	# STUDENTS	MODEL 1	0.05599	0.63338
HOOLS	URBAN/PUBLIC	# STUDENTS	MODEL 3	0.05618	0.63338
HOOLS	URBAN/PUBLIC	# STUDENTS	MODEL 4	0.03581	0.63338
HOOLS	URBAN/PUBLIC	# TEACHERS	MODEL 1	0.03487	0.21229
HOOLS	URBAN/PUBLIC	# TEACHERS	MODEL 3	0.03015	0.21229
HOOLS	URBAN/PUBLIC	# TEACHERS	MODEL 4	0.02761	0.21229

Example 1

Example 2

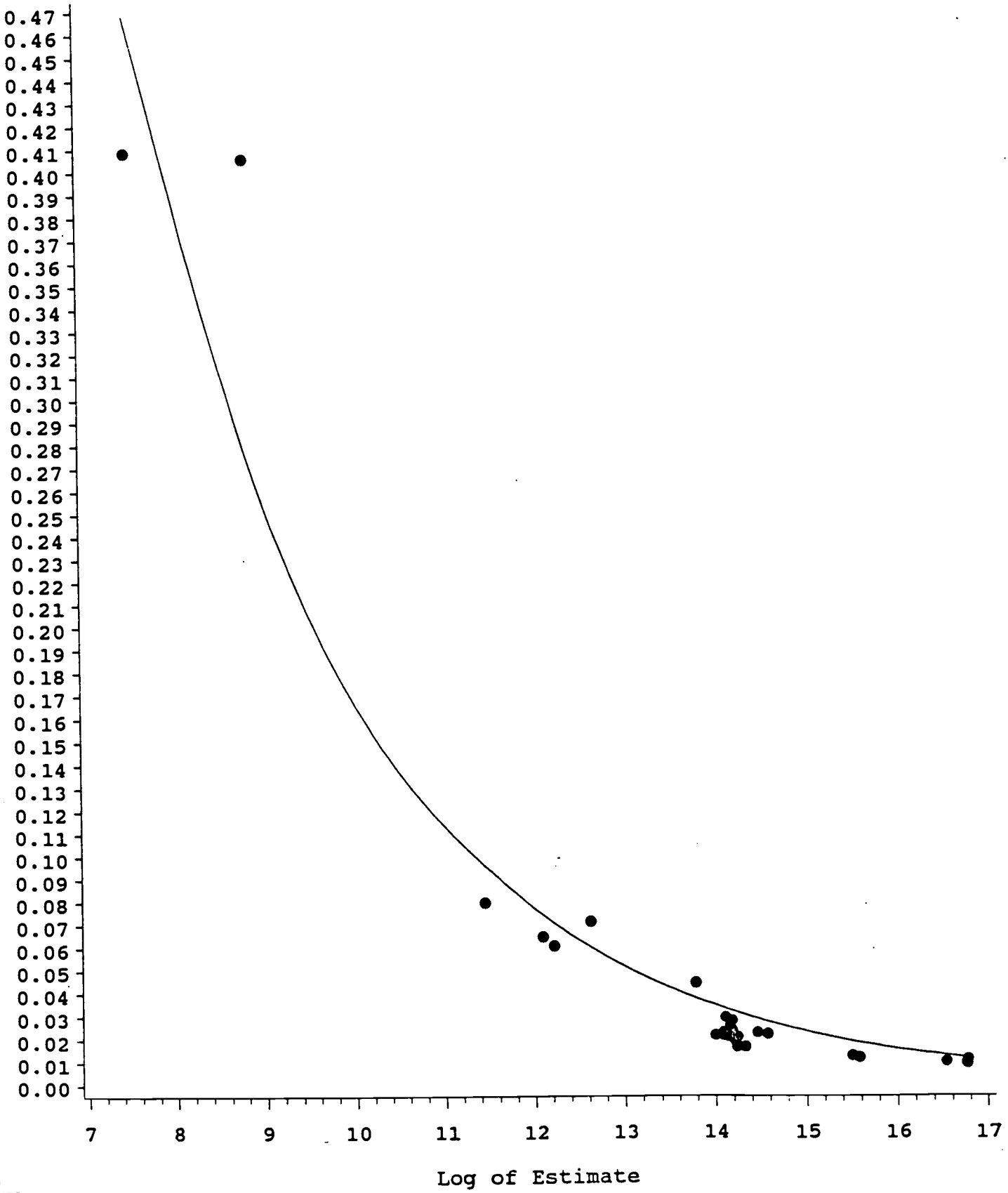
DETAILS OF RMSE FOR MODELS 1, 3 & 4

LE	SCH_TYPE	CATEGORY	MODEL	RMSE	AVG_CV
S	PRIVATE	# STUDENTS	MODEL 1	0.01259	0.07189
S	PRIVATE	# STUDENTS	MODEL 3	0.01302	0.07189
S	PRIVATE	# STUDENTS	MODEL 4	0.01363	0.07189
S	PRIVATE	# TEACHERS	MODEL 1	0.01381	0.13772
S	PRIVATE	# TEACHERS	MODEL 3	0.01354	0.13772
S	PRIVATE	# TEACHERS	MODEL 4	0.01432	0.13772
S	PUBLIC	# STUDENTS	MODEL 1	0.00948	0.04512
S	PUBLIC	# STUDENTS	MODEL 3	0.00787	0.04512
S	PUBLIC	# STUDENTS	MODEL 4	0.00635	0.04512
S	PUBLIC	# TEACHERS	MODEL 1	0.01586	0.09453
S	PUBLIC	# TEACHERS	MODEL 3	0.01557	0.09453
S	PUBLIC	# TEACHERS	MODEL 4	0.01570	0.09453

EXAMPLE 1 WHERE MODEL 4 HAS LOWER RMSE THAN MODEL 3

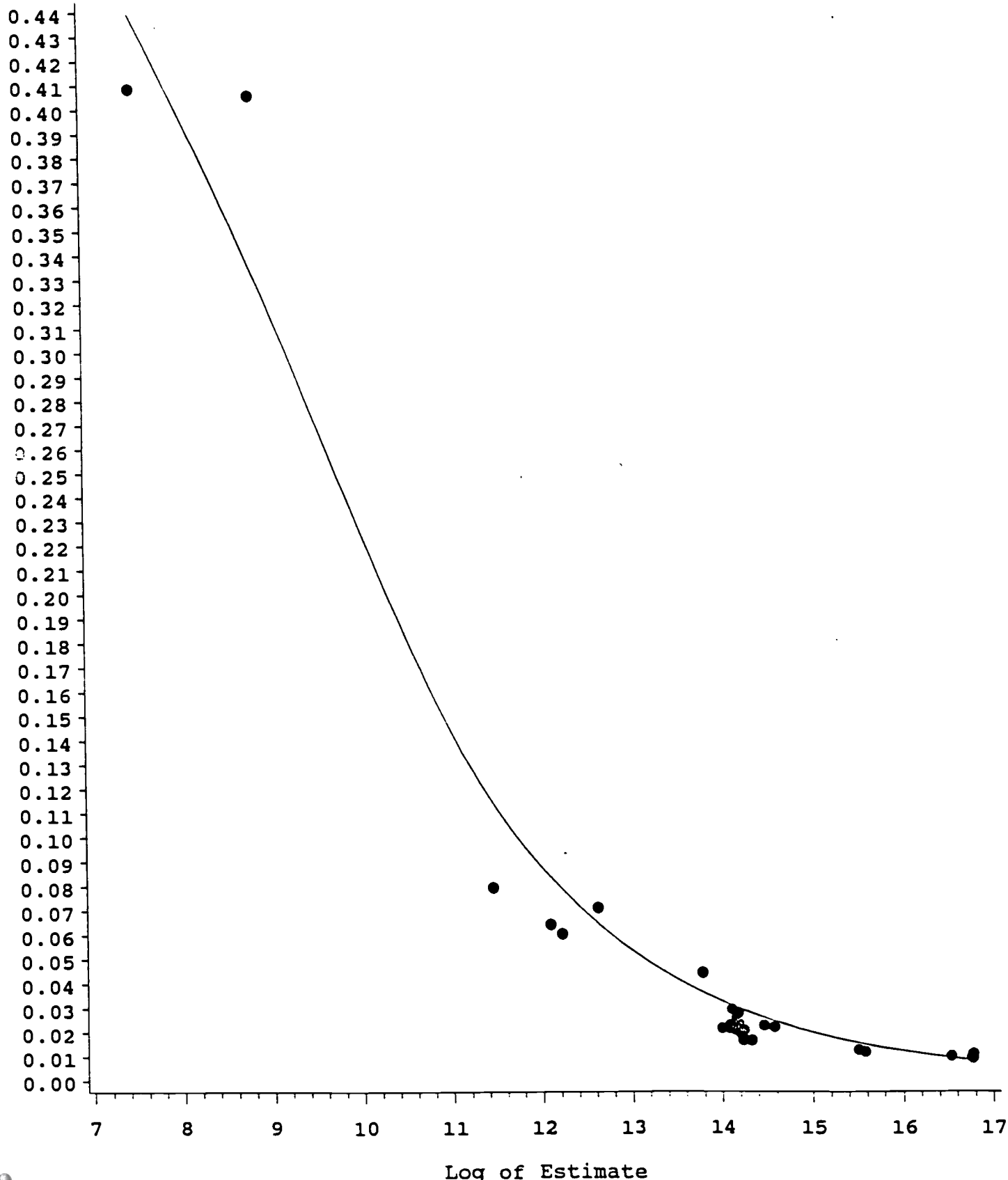
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=RURAL/PUBLIC CATEGORY=# STUDENTS MODEL=MODEL 3



Regression Curve Fit to Data

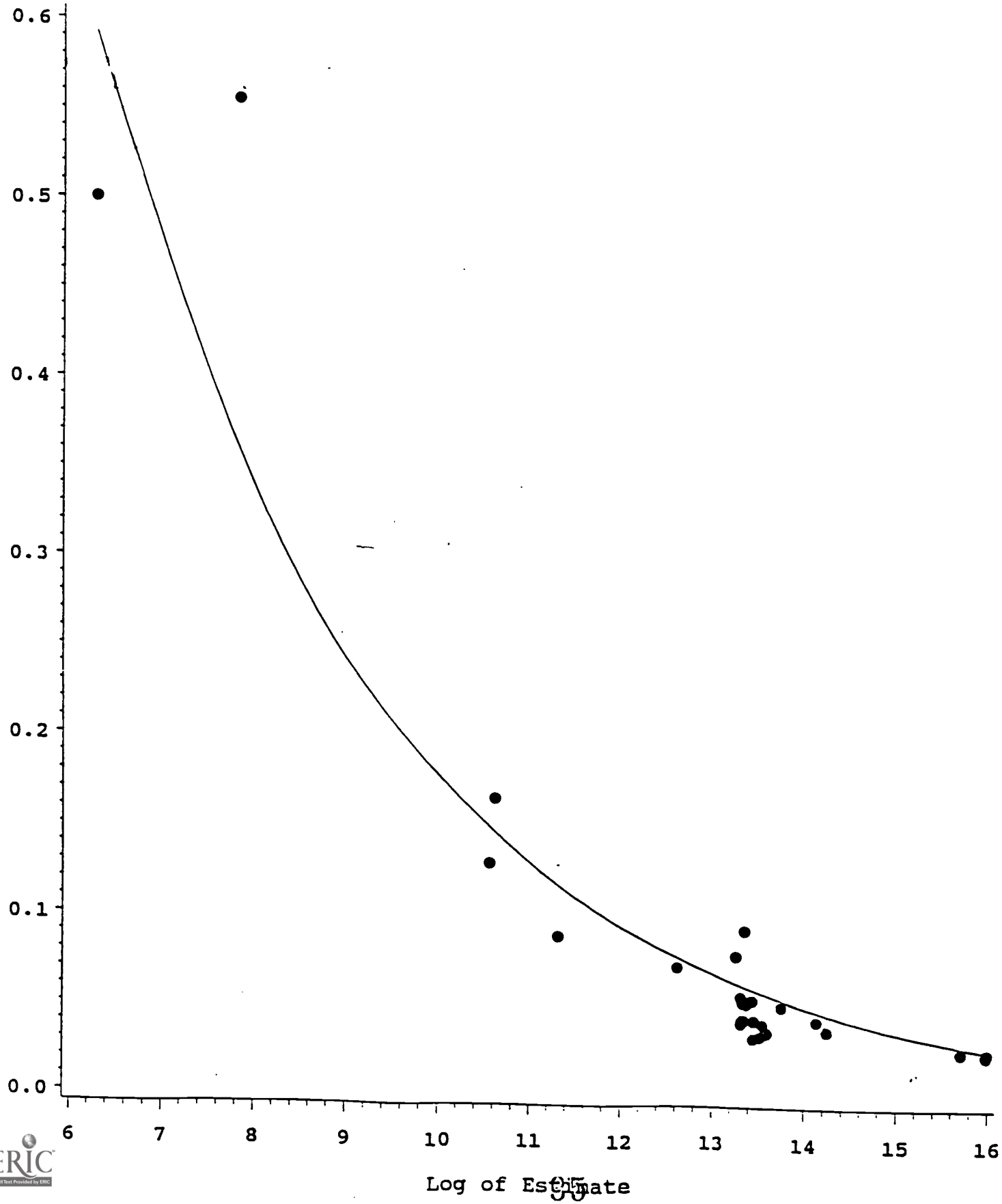
FILE=SCHOOLS SCHOOL TYPE=RURAL/PUBLIC CATEGORY=# STUDENTS MODEL=MODEL 4



EXAMPLE 2 WHERE MODEL 4 HAS LOWER RMSE THAN MODEL 3

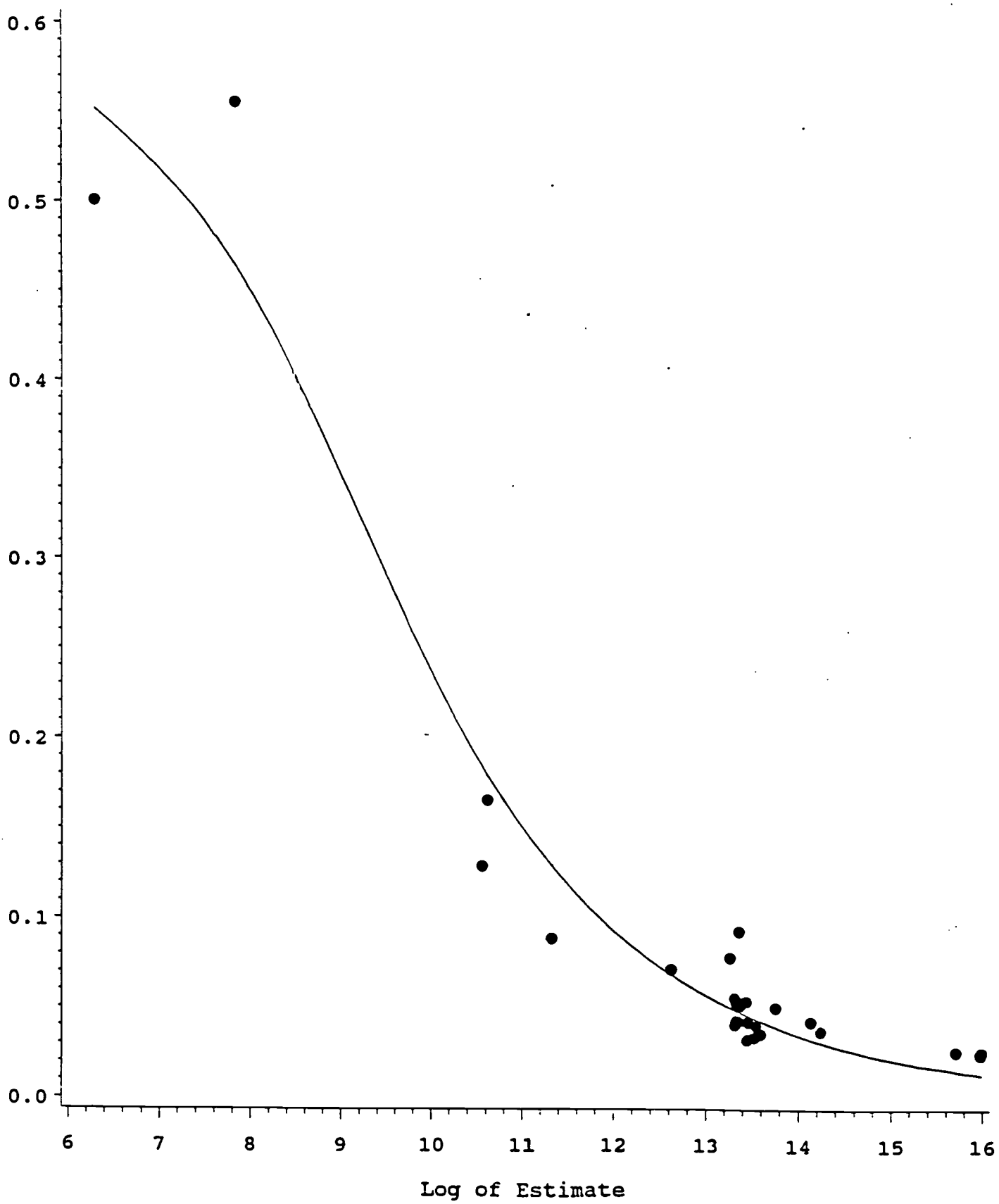
Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PUBLIC CATEGORY=# STUDENTS MODEL=MODEL 3



Regression Curve Fit to Data

FILE=SCHOOLS SCHOOL TYPE=SUBURBAN/PUBLIC CATEGORY=# STUDENTS MODEL=MODEL 4



APPENDIX II

GENERALIZED VARIANCE FUNCTIONS

THE SCHOOL SURVEY

GVFs FOR STUDENT TOTALS

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

GROUP	PARAMETERS A	PARAMETERS B	MEASURE OF FIT R-Squared
SECTOR			
Public	3.0930138139	-0.4815800560	0.9140
Private	2.2490585915	-0.4079517150	0.5500
REGION			
Northeast	2.7992842293	-0.4585107220	0.7886
NorthCentral	1.9006744602	-0.3921366560	0.6765
South	2.8271431627	-0.4592506510	0.8237
West	1.6638654353	-0.3728512040	0.7071
STATE			
Alabama	2.8797789308	-0.4760587980	0.8363
Alaska	1.1690404660	-0.3297505160	0.4313
Arizona	1.9229067120	-0.3839426190	0.6841
Arkansas	2.4253465865	-0.4447771660	0.7947
California	2.1624042818	-0.3967159560	0.7369
Colorado	2.6139975892	-0.4494459580	0.7263
Connecticut	2.3566345998	-0.4374461730	0.9009
Delaware	1.5115784525	-0.3959278770	0.7717
District of Columbia	1.3127318057	-0.3649457980	0.3029
Florida	3.0659065246	-0.4616857180	0.6624

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	1.6618032020	-0.3611250710	0.7240
Hawaii	2.0820759470	-0.4407515290	0.4088
Idaho	2.9475664759	-0.5101828110	0.8295
Illinois	2.0623108668	-0.4013154400	0.5644
Indiana	2.9645368063	-0.4802194910	0.7848
Iowa	1.6443140051	-0.3791974760	0.5304
Kansas	1.1225350080	-0.3308374960	0.5246
Kentucky	3.0005990045	-0.4825273460	0.8166
Louisiana	3.3129616174	-0.4952398480	0.8420
Maine	1.3461470254	-0.3587696430	0.8963
Maryland	1.9386472215	-0.3706014660	0.6748
Massachusetts	1.0469636462	-0.3174613700	0.7632
Michigan	1.8806086520	-0.3877731300	0.7612
Minnesota	1.0552976413	-0.2923304880	0.7298
Mississippi	1.5932478258	-0.3589382270	0.9060
Missouri	1.1571565212	-0.3200233720	0.7352
Montana	1.8827158231	-0.4074658540	0.6555
Nebraska	2.3602194084	-0.4305102770	0.6806
Nevada	1.8942054694	-0.4193660590	0.7910
New Hampshire	0.5533174993	-0.2698428690	0.6489

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Jersey	1.7701180686	-0.3681172690	0.7311
New Mexico	2.8979997566	-0.4647962400	0.7382
New York	1.2970251461	-0.3445658670	0.8383
North Carolina	2.9399434670	-0.4726822930	0.6862
North Dakota	1.8492174859	-0.4098139250	0.6127
Ohio	1.7120685467	-0.3662116530	0.8422
Oklahoma	3.4378759425	-0.5109495750	0.8527
Oregon	1.9840256960	-0.4023195960	0.7409
Pennsylvania	3.0893690327	-0.4702154400	0.8163
Rhode Island	0.7467455462	-0.2935518100	0.6529
South Carolina	1.6056384902	-0.3503600990	0.8127
South Dakota	1.3633105041	-0.3713592470	0.7586
Tennessee	0.9249946899	-0.3047525320	0.7166
Texas	3.8807965218	-0.5192782880	0.7861
Utah	2.5200296396	-0.4519855920	0.7086
Vermont	0.6300701899	-0.2739925210	0.5348
Virginia	2.9790399924	-0.4751140740	0.6739
Washington	2.5983367207	-0.4453798000	0.7870
West Virginia	2.3353871301	-0.4454393680	0.8200
Wisconsin	3.1903498967	-0.5008519550	0.9172

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-Squared
Wyoming	2.2155884527	-0.4520502430	0.7720
SECTOR/COMMUNITY STATUS			
Public Urban	2.0892640709	-0.3928145670	0.7136
Public Suburban	1.7484839749	-0.3508287740	0.7667
Public Rural	2.6662757434	-0.4482003910	0.8533
Private Urban	0.5726019554	-0.2584286260	0.4962
Private Suburban	1.5055588754	-0.3170923380	0.5721
Private Rural	2.3281727311	-0.4054477430	0.5198
SECTOR/REGION			
Public Northeast	2.9902508697	-0.4750186360	0.8054
Public North Central	1.6491910356	-0.3734595510	0.7314
Public South	2.9029885376	-0.4680976640	0.8519
Public West	1.6431549174	-0.3707705450	0.7010
Private Northeast	1.5192243990	-0.3393738830	0.5540
Private North Central	2.2478616345	-0.4057008220	0.4590
Private South	1.4266549604	-0.3135368850	0.3331
Private West	1.8655636699	-0.3766386290	0.5347
SECTOR/COMMUNITY STATUS/SCHOOL LEVEL			
Public Urban Elementary	3.0440178066	-0.4513082800	0.7329

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Public Urban Secondary	2.0383728860	-0.3716740380	0.8366
Public Urban Combined	0.5042785516	-0.1902717710	0.4493
Public Suburban Elementary	1.4343209416	-0.3128886940	0.6259
Public Suburban Secondary	3.3963661371	-0.4655232900	0.7666
Public Suburban Combined	0.1511933026	-0.1150904050	0.2558
Public Rural Elementary	1.8584698065	-0.3814493870	0.8009
Public Rural Secondary	2.6355142632	-0.4270186400	0.8654
Public Rural Combined	0.8577143020	-0.2962815890	0.4354
Private Urban Elementary	2.1173404633	-0.3884927460	0.5421
Private Urban Secondary	1.2739208871	-0.2771948950	0.8370
Private Urban Combined	0.2974585986	-0.1991836880	0.1828
Private Suburban Elementary	1.8135648304	-0.3434363280	0.6894
Private Suburban Secondary	1.3977743949	-0.2684954270	0.5203
Private Suburban Combined	0.5019765953	-0.2145158820	0.3631
Private Rural Elementary	1.8100108308	-0.3704678520	0.6916
Private Rural Secondary	1.7572481212	-0.3361864490	0.8613
Private Rural Combined	1.9672956515	-0.3541376120	0.3576

SECTOR/COMMUNITY STATUS/SCHOOL SIZE

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Public Urban School size < 150	0.8686015321	-0.2648868810	0.5138
Public Urban School size 150 to 500	1.8805065495	-0.3603870730	0.7752
Public Urban School size 500 to 750	1.7295074240	-0.3501821750	0.7939
Public Urban School size > 750	1.5099363694	-0.3284872050	0.5968
Public Suburban School size < 150	0.9316182149	-0.2425533800	0.6342
Public Suburban School size 150 to 500	1.8904568055	-0.3585575860	0.8758
Public Suburban School size 500 to 750	1.5479597135	-0.3074967280	0.7401
Public Suburban School size > 750	1.5807789552	-0.3210044040	0.7934
Public Rural School size < 150	0.8523663366	-0.2913521930	0.6953
Public Rural School size 150 to 500	2.1457457695	-0.4048754560	0.7814
Public Rural School size 500 to 750	1.9258480423	-0.3607494420	0.7108
Public Rural School size > 750	2.1751519215	-0.3722332870	0.8675

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Private Urban School size < than 150	0.0345446391	-0.1879090620	0.4900
Private Urban School size 150 to 500	1.4446450966	-0.3315911180	0.5200
Private Urban School size 500 to 750	0.7503343847	-0.2306037150	0.4704
Private Urban School size > 750	0.8651923405	-0.2142882140	0.3592
Private Suburban School size < 150	0.5042103578	-0.2325822340	0.6220
Private Suburban School size 150 to 500	1.3381806301	-0.3066432520	0.5686
Private Suburban School size 500 to 750	0.9087797073	-0.2360180840	0.3228
Private Suburban School size > 750	1.0503530363	-0.2284415850	0.6733
Private Rural School size < 150	1.5696151648	-0.3499960650	0.7181
Private Rural School size 150 to 500	2.5536059449	-0.4073917850	0.4343
Private Rural School size 500 to 750	0.2638529276	-0.1612791800	0.5964
Private Rural School size > 750	0.7428268316	-0.1633911630	0.4785

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-Squared
SECTOR/COMMUNITY STATUS/MINORITY STATUS			
Public Urban less than 20% minority	0.9742598504	-0.2764623180	0.5595
Public Urban 20% or more minority	1.2892321044	-0.3281343480	0.7302
Public Suburban less than 20% minority	1.2451807778	-0.3202805920	0.7565
Public Suburban 20% or more minority	1.3642222407	-0.2918449500	0.8116
Public Rural less than 20% minority	2.1130523491	-0.4142280940	0.7807
Public Rural 20% or more minority	2.0764305387	-0.3772556110	0.8186
Private Urban less than 20% minority	0.3490339390	-0.2440866230	0.5084
Private Urban 20% or more minority	0.1970916904	-0.2060975340	0.3863
Private Suburban less than 20% minority	0.9066963914	-0.2683955430	0.4248
Private Suburban 20% or more minority	1.8023027503	-0.3097393910	0.4550
Private Rural less than 20% minority	0.4471912384	-0.2645601430	0.4801

THE SCHOOL SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-Squared
Private Rural 20% or more minority	0.5685459329	-0.1950763690	0.2196

THE SCHOOL SURVEY

GVFs FOR TEACHER TOTALS

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
SECTOR			
Private	0.9878605902	-0.3719233950	0.4844
Public	0.9518458106	-0.4127428230	0.4782
REGION			
Northeast	1.8386513919	-0.4732980080	0.6067
NorthCentral	0.9801448885	-0.4038708760	0.4998
South	0.8340509837	-0.3820038940	0.4291
West	0.8734870832	-0.3947560840	0.4627
STATE			
Alabama	0.5545432112	-0.3683803380	0.6640
Alaska	0.1857606612	-0.3572668990	0.7632
Arizona	0.8342403936	-0.3990854060	0.5416
Arkansas	0.7976250296	-0.4051445390	0.8243
California	1.2918522981	-0.4204677200	0.4980
Colorado	0.6762448721	-0.3851334530	0.6620
Connecticut	0.5582436127	-0.3591997730	0.7285
Delaware	0.6285048265	-0.4405390070	0.4632
District of Columbia	0.7305333427	-0.3917625610	0.4928
Florida	1.2809780220	-0.3852105950	0.4262

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Georgia	1.1529762527	-0.4155636560	0.5516
Hawaii	0.5866107368	-0.3586376420	0.6108
Idaho	0.4715979639	-0.3710733720	0.7778
Illinois	1.2306412859	-0.4221462310	0.5955
Indiana	1.5348154972	-0.4751263230	0.5493
Iowa	0.3549858269	-0.3685244980	0.8215
Kansas	1.4610227491	-0.4435124240	0.6160
Kentucky	1.2639958543	-0.4285854120	0.7317
Louisiana	1.4900102499	-0.4611907650	0.4582
Maine	0.5771173946	-0.3657458680	0.7338
Maryland	0.1642505206	-0.2445991730	0.4828
Massachusetts	0.9664951514	-0.3823705680	0.7152
Michigan	0.5550340156	-0.3468511380	0.4148
Minnesota	0.7515026264	-0.3691490930	0.5835
Mississippi	0.6257935198	-0.3417916120	0.4703
Missouri	1.0208312408	-0.4127650580	0.6600
Montana	0.8391854747	-0.4266299780	0.7438
Nebraska	0.4925936787	-0.3493522700	0.7506
Nevada	0.0589052017	-0.3288359570	0.7978
New Hampshire	0.1871708673	-0.3310024590	0.8022

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
New Jersey	0.7466817802	-0.3707185610	0.8540
New Mexico	0.1215197862	-0.2965394010	0.8502
New York	1.0900955231	-0.4136800500	0.6821
North Carolina	0.9028977235	-0.4043848370	0.4955
North Dakota	-0.0133890610	-0.2517086510	0.2260
Ohio	1.5611604985	-0.4535101540	0.6252
Oklahoma	0.8191231558	-0.3935021910	0.7332
Oregon	0.9530683674	-0.4137292240	0.6214
Pennsylvania	1.3940026800	-0.4125460420	0.6865
Rhode Island	-0.0469422170	-0.3061271170	0.5047
South Carolina	0.3851996416	-0.3198930990	0.8133
South Dakota	0.8505982205	-0.4197971740	0.5149
Tennessee	1.3245897116	-0.4410363690	0.5597
Texas	1.2984160228	-0.4287164010	0.5783
Utah	0.2225448181	-0.3523472410	0.7772
Vermont	0.2589687053	-0.3495666390	0.6863
Virginia	1.2982177352	-0.4317924190	0.4821
Washington	0.8300221721	-0.4082710910	0.7951
West Virginia	1.0744446870	-0.4123905370	0.4900
Wisconsin	0.9046709055	-0.4021731920	0.7723

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Wyoming	0.4098292839	-0.3867107020	0.7245
SECTOR/COMMUNITY STATUS			
Public Urban	0.3047565701	-0.3267184480	0.4388
Public Suburban	-0.0369119820	-0.2841579330	0.5276
Public Rural	0.8911168504	-0.3913857510	0.6293
Private Urban	0.2874563086	-0.2884945250	0.4955
Private Suburban	0.3788228292	-0.2764105380	0.5948
Private Rural	0.9260419118	-0.3409552970	0.4902
SECTOR/REGION			
Public Northeast	2.0838043580	-0.5029935970	0.6231
Public North Central	1.1591938697	-0.4200046450	0.4885
Public South	1.5380124063	-0.4687432080	0.5785
Public West	1.4533151502	-0.4618923940	0.6080
Private Northeast	0.4604561359	-0.3110798190	0.5828
Private North Central	0.8852955264	-0.3628877170	0.5704
Private South	0.1760402129	-0.2490608450	0.3348
Private West	0.3999454631	-0.2858241910	0.2474
SECTOR/COMMUNITY STATUS/SCHOOL LEVEL			
Public Urban Elementary	0.3995131167	-0.3172575720	0.4398

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Public Urban Secondary	0.2819817735	-0.3113443570	0.5232
Public Urban Combined	-0.0599361640	-0.1968359380	0.3619
Public Suburban Elementary	-0.4731758360	-0.2136076840	0.5371
Public Suburban Secondary	0.5582447907	-0.3345336930	0.4980
Public Suburban Combined	0.0715631039	-0.1871312200	0.6694
Public Rural Elementary	1.1868538816	-0.4022917800	0.6469
Public Rural Secondary	0.4959870754	-0.3446954110	0.5570
Public Rural Combined	0.2798071089	-0.3027007310	0.5201
Private Urban Elementary	0.4598585220	-0.3033211690	0.4533
Private Urban Secondary	0.0219279567	-0.2309672870	0.5592
Private Urban Combined	0.2801724261	-0.2431579460	0.4069
Private Suburban Elementary	0.6933735962	-0.3067371280	0.4772
Private Suburban Secondary	0.1706449419	-0.2257781740	0.5673
Private Suburban Combined	-0.3107088040	-0.1625691100	0.5802
Private Rural Elementary	0.7067594273	-0.3198120710	0.5923
Private Rural Secondary	0.0518073234	-0.2358481690	0.7316
Private Rural Combined	0.9926116456	-0.3266815460	0.4780

SECTOR/COMMUNITY STATUS/SCHOOL SIZE

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Public Urban School size < 150	0.5591522742	-0.3296823750	0.8565
Public Urban School size 150 to 500	0.8419728920	-0.3491859020	0.6172
Public Urban School size 500 to 750	0.5783246614	-0.3336532060	0.5823
Public Urban School size > 750	-0.5012412330	-0.2358901090	0.6972
Public Suburban School size < 150	0.0591970843	-0.2271476650	0.7026
Public Suburban School size 150 to 500	0.4890647988	-0.3079515550	0.5125
Public Suburban School size 500 to 750	-0.2096741300	-0.2228421000	0.5709
Public Suburban School size > 750	-0.2484881640	-0.2479079410	0.5844
Public Rural School size < 150	0.7581781226	-0.3561096020	0.7203
Public Rural School size 150 to 500	0.9197509317	-0.3897780560	0.7015
Public Rural School size 500 to 750	0.6980363863	-0.3384119300	0.6117
Public Rural School size > 750	0.0382775115	-0.2685245050	0.4414

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Private Urban School size < than 150	0.6533888018	-0.2987071930	0.7292
Private Urban School size 150 to 500	0.4847799804	-0.3164562570	0.6255
Private Urban School size 500 to 750	0.3211140593	-0.2683507660	0.7398
Private Urban School size > 750	-0.1135027990	-0.1801380330	0.4258
Private Suburban School size < 150	0.5001048049	-0.2865622780	0.8147
Private Suburban School size 150 to 500	0.4658802576	-0.2949490300	0.6509
Private Suburban School size 500 to 750	0.4379158556	-0.2590114570	0.5339
Private Suburban School size > 750	-0.3558189470	-0.1331564000	0.5594
Private Rural School size < 150	0.8893338288	-0.3450648640	0.7942
Private Rural School size 150 to 500	0.5499008376	-0.2761502490	0.3549
Private Rural School size 500 to 750	0.0560003080	-0.1625398840	0.5178
Private Rural School size > 750	0.2235438697	-0.1766138980	0.5463

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
SECTOR/COMMUNITY STATUS/MINORITY ENROLLMENT			
Public Urban < 20% minority	0.0773005389	-0.263150622	0.4512
Public Urban 20%-up minority	0.5229575828	-0.343836077	0.6048
Public Suburban < 20% minority	0.3960299444	-0.330292232	0.5463
Public Suburban > 20% minority	-0.3948916700	-0.213219226	0.5966
Public Rural < 20% minority	1.4479726817	-0.436465221	0.6716
Public Rural > 20% minority	0.1298753851	-0.300397936	0.6488
Private Urban < 20% minority	0.5321597694	-0.3234378150	0.7354
Private Urban > 20% minority	0.4327245985	-0.2832679720	0.3641
Private Suburban < 20% minority	0.3503739619	-0.2773473800	0.6060
Private Suburban >20% minority	0.1014709278	-0.2112210970	0.5908
Private Rural < 20% minority	1.0804995023	-0.3721934400	0.7410

THE SCHOOL SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-SQUARED
Private Rural > 20% minority	-0.0613049790	-0.1599104190	0.1770

THE SCHOOL SURVEY

GVFs FOR AVERAGES

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
SECTOR			
Public	-0.1662	29.9610	0.9540
Private	-1.4664	277.2030	0.8921
REGION			
Northeast	-1.5848	5.0000	0.8484
NorthCentral	-1.1550	210.9160	0.6385
South	-0.7582	137.2450	0.8615
West	-1.1324	210.1150	0.9332
STATE			
Alabama	-5.5430	1032.1373	0.9273
Alaska	-18.0657	3258.6351	0.9438
Arizona	-16.3870	2912.6572	0.9383
Arkansas	-7.6185	1374.5358	0.9017
Colorado	-13.7233	2495.6111	0.6825
Connecticut	-5.2664	973.4004	0.8034
Delaware	-5.8220	1278.5677	0.8165
District of Columbia	28.1916	2027.7621	0.3902
Florida	-4.9797	969.8801	0.9135
Georgia	-3.6289	656.3239	0.9673
Hawaii	-12.5974	2242.7963	0.7942

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Idaho	-10.5614	1902.4503	0.9331
Illinois	-2.8406	538.3489	0.9414
Indiana	-2.9918	541.3059	0.8953
Iowa	-4.6279	835.7656	0.8995
Kansas	-6.0650	1112.3849	0.9016
Kentucky	-16.0376	2853.0489	0.7376
Louisiana	-2.8358	1102.7818	0.6262
Maine	-10.1473	1798.0838	0.7413
Maryland	-6.5185	1194.9349	0.9480
Massachusetts	-7.5361	1403.2855	0.7415
Michigan	-5.0576	925.9274	0.9290
Minnesota	-7.3406	1283.1514	0.8672
Mississippi	-22.1632	2855.8587	0.4613
Missouri	-56.4014	5420.9750	0.3994
Montana	-15.1616	2762.3391	0.8790
Nebraska	-8.8537	1577.9284	0.8963
Nevada	-44.6605	4271.6372	0.7942
New Hampshire	-30.8024	5554.7052	0.8742
New Jersey	-2.9506	534.2844	0.9258
New Mexico	-17.2001	3096.8833	0.7502

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New York	0.7327	308.4315	0.5036
North Carolina	-4.1225	776.5677	0.9626
North Dakota	-18.0892	3250.3771	0.9617
Ohio	-5.1865	938.1183	0.8232
Oklahoma	-6.5307	1160.9584	0.8680
Oregon	-11.0796	1981.8257	0.8366
Pennsylvania	-9.2087	1670.0374	0.7734
Rhode Island	-7.1347	1289.6026	0.9102
South Carolina*	0.0842	693.66	0.4733
South Dakota	-15.9812	2857.1830	0.9733
Tennessee	-6.4874	1181.4353	0.9831
Texas	-3.3038	586.7295	0.8430
Utah	-7.4484	1348.7169	0.9849
Vermont	-15.9419	2839.0941	0.8673
Virginia	-6.2222	1128.1273	0.8980
Washington	-9.0942	1636.4379	0.8924
West Virginia	-7.0550	1297.5351	0.8862
Wisconsin	-5.8881	1059.3647	0.9136
Wyoming	-11.2761	2003.6446	0.9587

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
SECTOR/COMMUNITY STATUS			
Public Urban	-0.50246	94.29	0.9616
Public Suburban	-0.76731	144.37	0.9556
Public Rural	0.36258	64.85	0.9713
Private Urban	-3.6746	687.3402	0.8987
Private Suburban	-9.0672	1160.9441	0.9959
Private Rural	-5.6283	1051.0546	0.6908
SECTOR/REGION			
Public Northeast*	-0.91549	165.66	0.9710
Public North Central*	-0.60966	112.64	0.8723
Public South*	-0.06384	47.67	0.9856
Public West	-1.2712	231.1184	0.8998
Private Northeast	-6.5258	1190.5129	0.7927
Private North Central	-6.8602	1284.6740	0.5554
Private South	-5.9890	1107.5209	0.9470
Private West	-9.5449	1821.0511	0.8197
SECTOR/SCHOOL LEVEL			
Urban Combined	-102.5930	17242.1702	0.3353
Urban Elementary	90.7902	-1171.5023	0.0460
Urban Secondary	0.5248	176.9732	0.7212

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Suburban Combined	-135.1477	26289.8394	0.6434
Suburban Elementary	-1.6032	292.2271	0.9672
Suburban Secondary	-1.4443	267.0202	0.9541
Rural Combined	-2.6667	482.8775	0.9715
Rural Elementary	-12.0593	1252.6815	0.3094
Rural Secondary	-0.0010	70.0839	0.9766
Urban Combined	-12.7205	2379.9319	0.8677
Urban Elementary	-16.1266	2964.8334	0.7134
Urban Secondary	-16.2520	2940.6910	0.6313
Suburban Combined	-17.1037	3105.5936	0.9250
Suburban Elementary	14.2492	1365.7029	0.7909
Suburban Secondary	-9.8722	2147.9834	0.7973
Rural Combined	-15.9563	2922.1263	0.8172
Rural Elementary	340.9696	-6468.7635	0.1432
Rural Secondary	-9.8672	2158.1537	0.6214
SECTOR/SCHOOL SIZE			
Urban School size < 150	-46.8233	8658.6401	0.8248
Urban School size 150 to 500	32.5725	-120.4698	0.0119
Urban School size 500 to 750	21.0084	-96.0946	0.0148
Urban School size > 750	-0.1453	223.9014	0.9352

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
Suburban School < 150	178.9611	2952.9584	0.8020
Suburban School size 150 to 500	-2.0962	1095.5282	-0.1011
Suburban School size 500 to 750	20.7808	-73.7670	0.0033
Suburban School size > 750	-1.4875	269.9118	0.9118
Rural School size < 150	-8.0019	1428.5394	0.9297
Rural School size 150 to 500	-0.7117	127.4360	0.9262
Rural School size 500 to 750	-1.2855	214.1138	0.6662
Rural School size > 750	0.6540	92.9462	0.8100
Urban School < than 150	-30.3118	5645.3336	0.8475
Urban School size 150 to 500	-4.2329	782.9779	0.8824
Urban School size 500 to 750	-8.3846	1832.3680	0.8489
Urban School size > 750	-12.0328	2224.3766	0.8689
Suburban School size < 150	57.8496	1443.8412	0.8428
Suburban School size 150 to 500	6.2768	1013.3674	0.7777
Suburban School size 500 to 750	-15.3574	2771.1950	0.7443
Suburban School size > 750	-11.8744	2142.3959	0.7521
Rural School size < 150	-46.3488	4590.2383	0.6975
Rural School size 150 to 500	-5.2424	1003.5574	0.8525

THE SCHOOL SURVEY
GVFs FOR AVERAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
Rural School size 500 to 750	-30.3110	5448.6400	0.8474
Rural School Size > 750	-79.8817	14600.2072	0.6109
SECTOR/MINORITY STATUS			
Rural 20% or more minority	-83.1669	8065.1086	0.9313

THE TDS SURVEY

GVFs FOR STUDENT TOTALS

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
SECTOR			
Public	0.0000180011	237.5335188500	0.6491
Private	0.0006079795	730.1049242500	0.3841
REGION			
Northeast	0.0000995605	350.0369934100	0.6534
NorthCentral	0.0001150960	244.9274718600	0.6324
South	0.0000089663	594.6639783600	0.7275
West	0.0000423829	488.3256937300	0.7651
STATE			
Alabama	0.0007349134	93.0408635450	0.3940
Alaska	0.0002473447	1.4636664171	0.2750
Arizona	0.0002201742	616.8415912900	0.6215
Arkansas	0.0001912593	328.9667951000	0.4980
California	0.0001844121	415.8781118700	0.7959
Colorado	0.0007120209	250.9559645000	0.6350
Connecticutt	0.0018874206	281.5268089600	0.2242
Delaware	0.0009537743	20.3957497750	0.7684
District of Columbia	0.0021256833	1.2700192599	0.0096
Florida	0.0002796369	157.0621014800	0.2246

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	0.0010956308	109.4561197900	0.3220
Hawaii	-0.0008845260	437.0823242300	0.4809
Idaho	0.0003592975	98.0607191720	0.6326
Illinois	0.0004527954	107.5466514800	0.7173
Indiana	0.0003408532	362.1365940000	0.7308
Iowa	0.0006377216	90.3407676280	0.5799
Kansas	0.0004649995	127.5486589600	0.5925
Kentucky	0.0010486107	392.6110841200	0.3894
Louisiana	0.0003774440	62.8670422870	0.5258
Maine	0.0027063613	78.1176571290	0.8403
Maryland	0.0033940505	-3.7663445970	0.2739
Massachusetts	0.0026241369	74.2572870100	0.2591
Michigan	0.0005252650	201.1362154300	0.6731
Minnesota	0.0009793620	131.5936624100	0.6351
Mississippi	0.0018611535	47.8649525330	0.7778
Missouri	0.0006610952	240.7457930500	0.3617
Montana	0.0068518066	45.9082450990	0.3561
Nebraska	0.0020762651	34.5177753740	0.6898
Nevada	-0.0010805840	110.9299463300	0.5776

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	0.0031195330	13.0126171560	0.3604
New Jersey	0.0013397280	534.5625278200	0.4337
New Mexico	0.0002165229	274.1320733500	0.4166
New York	0.0002322580	144.0926844000	0.3664
North Carolina	0.0007085116	180.3024253200	0.3809
North Dakota	0.0017293102	52.2252703750	0.2986
Ohio	0.0009146157	422.9360574600	0.5375
Oklahoma	0.0042231600	113.4822752400	0.2735
Oregon	0.0010636868	122.6191856000	0.5912
Pennsylvania	0.0014740200	79.3709590900	0.2636
Rhode Island	0.0005887682	12.1803178420	0.2813
South Carolina	0.0027791328	228.4880793800	0.5227
South Dakota	0.0012838716	38.0565370600	0.7823
Tennessee	0.0015144245	22.3502843460	0.2539
Texas	0.0000650997	538.0398927400	0.5088
Utah	0.0000113216	138.7874121900	0.5915
Vermont	0.0101177646	9.1464289609	0.2392
Virginia	0.0003813630	105.8277416000	0.5877
Washington	0.0015049146	309.0036929700	0.5178

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
West Virginia	-0.0000458020	26.6260243100	0.4819
Wisconsin	0.0007413693	246.0011568900	0.5946
Wyoming	-0.0002223620	60.2146444850	0.5464
SECTOR/REGION			
Public Northeast	0.0000973709	219.2477749600	0.4888
Public North Central	0.0001455023	188.5261140500	0.5490
Public South	0.0000225074	238.3774756500	0.5084
Public West	0.0001238494	259.2674677800	0.6503
Private Northeast	0.0021379913	540.9644345100	0.6283
Private North Central	0.0009741594	247.3064966500	0.3874
Private South	0.0020775330	1227.1040866000	0.5700
Private West	0.0020349329	663.5827230100	0.4490
SECTOR/SCHOOL SIZE			
Public School size < 150	0.0054466321	320.1390907500	0.4315
Public School size 150 to 500	0.0010963310	545.5674194700	0.7900
Public School size 500 to 750	0.0030229790	515.7661039700	0.4893
Public School size > 750	0.0000244152	236.3706082400	0.5819
Private School < than 150	0.0020220111	844.9866992000	0.9583

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR STUDENT TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
Private School size 150 to 500	0.0004451005	1668.2900238000	0.9634
Private School size 500 to 750	0.0070520622	828.8476588400	0.7755
Private School size > 750	0.0185704997	647.1710872400	0.9263
SECTOR/MINORITY STATUS			
Public less than 20% minority	0.0000844236	124.4819196500	0.7020
Public 20% or more minority	0.0000474694	227.2098063900	0.5677

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TDS SURVEY

GVFs FOR TEACHER TOTALS

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
SECTOR			
Public	0.0000143934	27.7965357150	0.6004
Private	0.0006029196	55.7521276750	0.6428
REGION			
Northeast	0.0000958215	44.0211866660	0.5344
NorthCentral	0.0001351847	39.0908062800	0.5193
South	0.0000076371	42.4849125630	0.6801
West	0.0000542048	25.9695570480	0.5240
STATE			
Alabama	0.0004797530	14.8414060730	0.4784
Alaska	0.0001796790	0.7418463363	0.5278
Arizona	0.0016983308	9.9502975913	0.3952
Arkansas	0.0015234398	20.7581013430	0.4004
California	0.0001146612	31.4881088080	0.5816
Colorado	0.0015673291	7.0141199579	0.6978
Connecticutt	0.0018778028	16.1348982120	0.2268
Delaware	0.0005882625	2.3001105876	0.7957
District of Columbia	0.0028526718	2.1197018214	0.6028
Florida	0.0008026073	2.2000710845	0.1955

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	0.0016230985	6.4132980575	0.2398
Hawaii	0.0017274612	10.0877242390	0.3173
Idaho	0.0016794465	4.0466826321	0.4261
Illinois	0.0003217594	16.6273301220	0.2923
Indiana	0.0006953521	12.9608033820	0.3971
Iowa	0.0008779974	14.4401800700	0.5792
Kansas	0.0008038252	6.3958814746	0.4602
Kentucky	0.0011162401	33.5741518380	0.5137
Louisiana	0.0003743526	3.3865252371	0.5962
Maine	0.0053737222	3.7431407606	0.5075
Maryland	0.0019488122	19.4942314080	0.3491
Massachusetts	0.0016589727	13.6095334540	0.3626
Michigan	0.0007233416	22.9140231940	0.6208
Minnesota	0.0019765313	14.6578226990	0.2767
Mississippi	0.0015506949	5.0033141102	0.6124
Missouri	0.0008714936	15.2693447840	0.2239
Montana	0.0026195354	10.5252602060	0.6923
Nebraska	0.0027919900	4.0145137314	0.5255
Nevada	-0.0006648370	8.6786138881	0.8478

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	0.0028824150	3.3360279762	0.2874
New Jersey	0.0028838682	24.5636275280	0.2360
New Mexico	0.0015384986	11.1000117600	0.4187
New York	0.0002471815	25.4675415300	0.4441
North Carolina	0.0002208849	16.7378072770	0.5673
North Dakota	0.0024957966	7.1521577647	0.3313
Ohio	0.0011013612	59.8010775600	0.4115
Oklahoma	0.0024324338	19.7414783930	0.4425
Oregon	0.0011971628	4.6384689712	0.6443
Pennsylvania	0.0012608990	16.7892609500	0.4663
Rhode Island	0.0014044554	1.2461986967	0.3407
South Carolina	0.0045446065	10.2826792090	0.3738
South Dakota	0.0025236906	6.3908254662	0.2970
Tennessee	0.0012285779	5.1526314619	0.7234
Texas	0.0001655934	45.4051631220	0.3900
Utah	0.0007272202	1.9325355109	0.4285
Vermont	0.0056743631	2.7196067594	0.6291
Virginia	0.0004768732	4.9172491582	0.4987
Washington	0.0021811453	12.1036290220	0.2750

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
West Virginia	0.0000257360	1.4203870993	0.6744
Wisconsin	0.0015216764	9.1659801545	0.7041
Wyoming	0.0010474079	3.6354897354	0.4890
SECTOR/REGION			
Public Northeast	0.0001158532	31.8981263000	0.4121
Public North Central	0.0001655069	35.0670167090	0.4793
Public South	0.0000150440	17.9160510930	0.5357
Public West	0.0001581371	5.0872078142	0.8981
Private Northeast	0.0018382453	48.7067826410	0.8468
Private North Central	0.0009144564	28.6436830270	0.9114
Private South	0.0026700303	72.6972815660	0.5035
Private West	0.0010557101	52.9359921500	0.6110
SECTOR/SCHOOL SIZE			
Public School size < 150	0.0158171452	26.8602095150	0.6228
Public School size 150 to 500	0.0012868733	36.2619679710	0.8053
Public School size 500 to 750	0.0027640721	40.1045385800	0.5383
Public School size > 750	0.0000178983	27.4534090790	0.5473
Private School size < than 150	0.0026181012	41.8845858650	0.8420
Private School size 150 to 500	0.0010416297	50.9086159160	0.5681

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVFs FOR TEACHER TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Private School size 500 to 750	0.0071920689	31.1446373630	0.8597
Private School size > 750	0.0152273877	50.1246297440	0.8998
SECTOR/MINORITY STATUS			
Public less than 20% minority	0.0000233158	56.1029393710	0.6029
Public 20% or more minority	0.0000572712	18.9757903300	0.4860

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TDS SURVEY

GVFs FOR AVERAGES

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVF'S FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B\ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
SECTOR			
Public	1.4664	-0.7776	0.6077
Private	2.4587	-0.5663	0.7199
REGION			
Region NE	2.4800	-0.6788	0.4688
Region NC	1.9556	-0.6389	0.3981
Region South	1.9509	-0.6702	0.5806
Region West	1.4804	-0.5017	0.6386
STATE			
Alabama	3.3291	-0.7086	0.4761
Alaska	1.1497	-0.0894	0.0371
Arizona	3.0609	-0.7492	0.6637
Arkansas	3.5632	-0.6539	0.5859
California	2.0952	-0.5247	0.5819
Colorado	2.4609	-0.4985	0.4612
Connecticut	3.6418	-0.5533	0.3812
Delaware	3.1044	-0.5455	0.4121
D.C.	3.0923	-0.4461	0.2812
Florida	1.9970	-0.3941	0.3065

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVF'S FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	1.6640	-0.3825	0.6322
Hawaii	2.3395	-0.4471	0.5328
Idaho	3.0553	-0.5003	0.3804
Illinois	2.2873	-0.6940	0.6094
Indiana	2.1753	-0.5698	0.6385
Iowa	2.9398	-0.6782	0.5368
Kansas	2.6818	-0.5436	0.4589
Kentucky	3.6192	-0.7021	0.6037
Louisiana	2.6358	-0.6462	0.6726
Maine	3.0078	-0.6223	0.5568
Maryland	2.8123	-0.4865	0.5306
Massachusetts	2.6714	-0.6339	0.5906
Michigan	2.6770	-0.7203	0.7996
Minnesota	2.5106	-0.6117	0.7251
Mississippi	2.9080	-0.6973	0.5611
Missouri	2.3820	-0.6015	0.3914
Montana	3.4111	-0.6198	0.5884
Nebraska	2.9731	-0.7962	0.6149
Nevada	2.9411	-0.6392	0.4962

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVF'S FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	3.5305	-0.6014	0.5548
New Jersey	3.5204	-0.7403	0.5705
New Mexico	2.8371	-0.5401	0.5233
New York	2.3300	-0.5388	0.5015
North Carolina	2.2227	-0.5730	0.5723
North Dakota	3.8540	-0.9152	0.5412
Ohio	3.3637	-0.6339	0.3439
Oklahoma	3.4471	-0.7569	0.6137
Oregon	2.6741	-0.6062	0.5615
Pennsylvania	3.0265	-0.5349	0.3059
Rhode Island	1.9712	-0.2266	0.2544
South Carolina	3.1001	-0.6158	0.7326
South Dakota	2.8019	-0.6880	0.6214
Tennessee	2.2697	-0.5773	0.5535
Texas	2.7840	-0.6237	0.4604
Utah	0.8322	-0.2374	0.3715
Vermont	3.2918	-0.6171	0.5963
Virginia	1.8420	-0.3918	0.4473
Washington	2.3399	-0.5526	0.6381

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVF'S FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B\ lnX)}$

GROUP	PARAMETERS		MEASURE OF FIT
	A	B	R-Squared
West Virginia	1.8878	-0.6371	0.5152
Wisconsin	2.5227	-0.5187	0.4576
Wyoming	2.9445	-0.6829	0.4664
SECTOR/REGION			
Public/Region NE	2.2666	-0.7329	0.4734
Public/Region NC	1.9348	-0.8164	0.8886
Public/Region South	1.9334	-0.7578	0.9991
Public/Region West	1.2215	-0.5724	0.4556
Private/Region NE	3.3600	-0.6477	0.6987
Private/Region NC	2.9001	-0.5510	0.5682
Private/Region South	3.0984	-0.5318	0.6954
Private/Region West	3.1947	-0.5087	0.8455
SECTOR/SCHOOL SIZE			
Public/ size < 150	3.7366	-0.6903	0.7528
Public/ size 150 to 500	3.3667	-0.8036	0.9023
Public/ size 500 to 750	3.6340	-0.8684	0.8141
Public/ size > 750	1.4530	-0.7663	0.2828
Private/ size < 150	3.2385	-0.5668	0.6170
Private/ size 150 to 500	2.5663	-0.5165	0.8055

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER DEMAND AND SHORTAGE SURVEY
GVF'S FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-Squared
Private/ size 500 to 750	3.2479	-0.5316	0.2821
Private/ size > 750	3.5241	-0.6078	0.2729
SECTOR/MINORITY STATUS			
Public/Under 20% minority	1.6902	-0.7599	0.2854
Public/20%-up minority	1.7991	-0.8149	0.9999
Private/Under 20% minority	2.4587	-0.5663	0.7100

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINSTRATOR SURVEY

GVFs FOR PERCENTAGES

THE SCHOOL ADMINISTRATOR SURVEY
GVF'S FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
SECTOR			
Public	-1.3913	141.6077	0.9767
Private	-8.8341	889.5913	0.9259
REGION			
Region NE	-8.6254	759.6755	0.8122
Region NC	-4.0542	416.3389	0.9397
Region South	-4.5160	464.8932	0.8499
Region West	-6.5447	667.7420	0.9817
STATE			
Alabama	-44.6824	4623.3401	0.9637
Alaska	-91.1802	9341.2190	0.9736
Arizona	-79.9005	8213.4872	0.9630
Arkansas	-83.2752	8493.0414	0.8533
California	-16.7835	1711.5779	0.9862
Colorado	-75.0859	7616.8063	0.9158
Connecticut	-74.5558	7491.7639	0.9819
Delaware	-93.5526	9425.4351	0.9653
D.C.	-115.2678	11926.5071	0.9564
Florida	-56.6015	5388.4420	0.7772

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVF'S FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	-51.5594	5210.9327	0.9039
Hawaii	-88.6146	11401.8170	0.8654
Idaho	-78.6422	12397.5528	0.7588
Illinois	-42.5649	2626.3673	0.8085
Indiana	-39.2297	3888.5430	0.9743
Iowa	-63.3881	6329.4056	0.9362
Kansas	-73.8543	7443.0652	0.9656
Kentucky	-90.7350	9110.5900	0.9094
Louisiana	-46.3237	5233.9645	0.8871
Maine	-103.5181	10331.4177	0.9682
Maryland	-74.0082	7302.0190	0.9640
Massachusetts	-56.2819	5700.8544	0.9083
Michigan	-27.7861	2844.4258	0.9108
Minnesota	-45.4080	4541.6990	0.9827
Mississippi	-69.5056	9442.6855	0.6457
Missouri	-49.7073	4960.9725	0.9821
Montana	-114.2754	11405.2411	0.9478
Nebraska	-66.9944	6779.3647	0.9882
Nevada	-187.2045	18631.6471	0.8648

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVF'S FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	-103.8267	10548.3906	0.9832
New Jersey	-34.2293	3427.1210	0.9451
New Mexico	-116.3555	11456.1038	0.9362
New York	-18.6814	1901.0647	0.9908
North Carolina	-49.1951	4891.8904	0.9760
North Dakota	-87.0142	8792.2940	0.9792
Ohio	-26.7703	3069.7294	0.8534
Oklahoma	-70.5783	7217.2787	0.9849
Oregon	-75.2188	7528.9127	0.9632
Pennsylvania	-32.9060	3646.0883	0.8192
Rhode Island	-80.9419	7967.2494	0.9052
South Carolina	-71.1148	7692.8386	0.8465
South Dakota	-93.9234	9564.5755	0.9754
Tennessee	-59.0059	5819.4340	0.9837
Texas	-18.4373	2161.3069	0.7260
Utah	-92.3752	9228.5547	0.9335
Vermont	-95.2779	9756.5638	0.9803
Virginia	-63.8814	6864.1689	0.8550
Washington	-58.3198	5888.6522	0.9319

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVF'S FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

GROUP	PARAMETERS		MEASURE OF FIT
	A	B	R-Squared
West Virginia	-78.3514	7806.1855	0.9462
Wisconsin	-38.3651	3772.1002	0.9116
Wyoming	-106.9707	10660.7201	0.9756
SECTOR/REGION			
Public/Region NE	-7.5492	749.4497	0.9782
Public/Region NC	-5.1511	527.5986	0.9722
Public/Region South	-3.8525	387.4635	0.9835
Public/Region West	-11.7944	815.0420	0.9997
Private/Region NE	-26.2822	2818.2921	0.8806
Private/Region NC	-45.3379	1446.9023	0.8557
Private/Region South	-34.9872	3488.2752	0.9033
Private/Region West	-37.4402	3845.1684	0.9678
SECTOR/SCHOOL LEVEL			
Public Elementary*	-3.2353	315.44	0.9809
Public Secondary	-3.5583	360.8188	0.9698
Public Combined	-22.1343	1132.8696	0.9963
Private Elementary	-10.3781	956.8122	0.9923
Private Secondary	-55.0750	5519.4871	0.9276
Private Combined	-28.5577	2871.3863	0.9644

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY

GVFs FOR ADMINISTRATOR TOTALS

THE SCHOOL ADMINISTRATOR SURVEY
GVFs FOR ADMINISTRATOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
SECTOR			
Public	-1.3086	111702.1290	0.9738
Private	-2.7058	215412.6660	0.8589
REGION			
Region NE	-4.6303	148979.5602	0.7886
Region NC	-2.8342	124068.1692	0.9437
Region South	-3.2809	150186.0941	0.8409
Region West	-4.5600	130618.2167	0.9725
STATES			
Alabama	-38.0981	74432.8312	0.9541
Alaska	-65.5022	47478.6486	0.9613
Arizona	-66.9265	90975.2665	0.9537
Arkansas	-74.5834	109293.0243	0.8232
California	-12.7663	166277.0947	0.9723
Colorado	-29.7264	103966.0872	0.8133
Connecticut	-57.0628	78996.7555	0.8652
Delaware	-64.2238	19474.5074	0.9147
D.C.	-95.4094	30557.8521	0.9291

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVFs FOR ADMINISTRATOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Florida	-31.4522	179019.7239	0.6484
Georgia	-33.7418	105931.1141	0.8673
Hawaii	-70.0249	43751.5131	0.7791
Idaho	-41.5332	70953.5687	0.7770
Illinois	-5.0899	129512.1751	0.8490
Indiana	-33.7831	88917.6729	0.9681
Iowa	-43.5727	114220.5279	0.9351
Kansas	-58.6273	113198.8641	0.9659
Kentucky	-41.7991	127624.4182	0.8551
Louisiana	-6.8188	88002.5445	0.8889
Maine	-48.7958	82057.9746	0.9381
Maryland	-20.0835	128917.2061	0.8856
Massachusetts	-47.2636	129764.5538	0.8790
Michigan	-17.8081	109842.1874	0.9213
Minnesota	-37.9300	82733.4221	0.9738
Mississippi	-104.0617	119542.9975	0.6099
Missouri	-41.1128	115201.8005	0.9708
Montana	-76.7924	73793.3602	0.9526
Nebraska	-50.5396	76753.1817	0.9864

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVFs FOR ADMINISTRATOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Nevada	-23.5257	68371.5687	0.6184
New Hampshire	-63.0090	52486.4598	0.9494
New Jersey	-31.9766	102128.4803	0.9449
New Mexico	11.4857	66813.4916	0.9099
New York	-15.2705	110657.1919	0.9863
North Carolina	-42.3864	106050.6874	0.9762
North Dakota	-62.0925	41996.0337	0.9454
Ohio	-18.7904	175200.7250	0.8098
Oklahoma	-63.5206	133584.4277	0.9843
Oregon	-51.8691	93632.8737	0.9602
Pennsylvania	-11.8913	191560.8611	0.7205
Rhode Island	-39.2544	26366.9206	0.8835
South Carolina	-1.6727	76471.0495	0.8475
South Dakota	-57.9600	62450.6094	0.9701
Tennessee	-55.3500	112362.1552	0.9708
Texas	13.4869	97646.7511	0.7048
Utah	-79.6954	61633.3369	0.9251
Vermont	-76.1524	39182.4854	0.9579
Virginia	-31.8975	138558.3787	0.7555

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVFs FOR ADMINISTRATOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Washington	-51.9989	117459.0334	0.9206
West Virginia	-52.8207	74982.3522	0.9327
Wisconsin	-22.3169	86641.2471	0.9182
Wyoming	-70.9697	36524.5743	0.9708
SECTOR/REGION			
Public/Region NE	-6.6899	101160.9623	0.9792
Public/Region NC	-4.9063	121744.4331	0.9800
Public/Region South	-3.4568	99142.3916	0.9837
Public/Region West	-11.5646	127732.3103	0.9982
Private/Region NE	-0.5550	173466.8595	0.7912
Private/Region NC	-2.3657	153240.1097	0.9054
Private/Region South	13.6665	205114.0300	0.7869
Private/Region West	-8.0654	167255.7536	0.9457
SECTOR/SCHOOL LEVEL			
Private. Elementary	-2.3443	134994.1966	0.9751
Private. Secondary	-3.2564	67379.6788	0.9712
Private. Combined	-20.5640	68808.6467	0.9859
Private. Elementary	-7.5988	120886.3148	0.9804
Private. Secondary	-33.6429	111340.8200	0.8991

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY
GVFs FOR ADMINISTRATOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-SQUARED
Private. Combined	-16.3543	147737.2257	0.9442

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATOR SURVEY

GVFs FOR AVERAGES

THE SCHOOL ADMINISTRATORS SURVEY
GVFs FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-squared
SECTOR			
Public	1.1103558286	-0.5953709850	0.8693
Private	1.9135293724	-0.4661093660	0.6302
REGION			
Northeast	1.8073460977	-0.4560937130	0.6935
North Central	1.9431534044	-0.7121065020	0.6337
South	1.9027412068	-0.6657900230	0.6605
West	1.8845336070	-0.5562217420	0.7811
STATE			
Alabama	2.9296502061	-0.5435421680	0.7908
Alaska	2.9043252983	-0.3324378370	0.7358
Arizona	3.2039850103	-0.5397174600	0.7365
Arkansas	3.0548190852	-0.5005080730	0.8475
California	2.2901145964	-0.4800115190	0.7096
Colorado	2.9684714040	-0.4002796900	0.5904
Connecticut	2.8238736523	-0.4388094450	0.9251
Delaware	3.1893342033	-0.4929312350	0.8343

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATORS SURVEY
GVFs FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-squared
D.C.	3.1294714586	-0.4327501170	0.6528
Florida	2.6580191461	-0.4411133260	0.6377
Georgia	2.7408638138	-0.4187335350	0.7400
Hawaii	3.2223729545	-0.4228625480	0.5329
Idaho	3.2709096339	-0.4770130890	0.6593
Illinois	2.5382152471	-0.5263730120	0.8163
Indiana	2.8093361458	-0.5314470430	0.7662
Iowa	3.0815594693	-0.5596400570	0.6572
Kansas	3.0009138128	-0.4731139730	0.8021
Kentucky	3.1898136468	-0.5134957520	0.7659
Louisiana	2.8987756194	-0.4290809620	0.5923
Maine	3.2549600399	-0.5086304260	0.6653
Maryland	2.9225746832	-0.4635741810	0.7711
Massachusetts	2.6222492063	-0.3822826900	0.7303
Michigan	2.6758248705	-0.4989866020	0.7616
Minnesota	2.9412763065	-0.4856191830	0.7299
Mississippi	3.0152212808	-0.4192547010	0.7809
Missouri	2.9305683065	-0.5305175110	0.8031

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATORS SURVEY
GVFs FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-squared
Montana	3.3954228674	-0.5476640780	0.7949
Nebraska	3.0888954895	-0.4838324000	0.7328
Nevada	3.2536011164	-0.3339018390	0.5661
New Hampshire	3.1593866419	-0.4803633640	0.8028
New Jersey	2.5616192317	-0.4834227960	0.7792
New Mexico	3.0617437931	-0.3235938530	0.4930
New York	2.4110425114	-0.5090219390	0.6374
North Carolina	2.7515452405	-0.4732963750	0.8339
North Dakota	3.1612959495	-0.4155876230	0.6724
Ohio	2.5647948315	-0.4844553250	0.7838
Oklahoma	2.8718050727	-0.4259624000	0.8252
Oregon	3.0359746710	-0.5331611220	0.8361
Pennsylvania	2.7004208150	-0.4545526720	0.6410
Rhode Island	3.1216100106	-0.4956583510	0.8509
South Carolina	2.9931105332	-0.4573924910	0.6120
South Dakota	3.1555122914	-0.4691926380	0.7747
Tennessee	3.1931877190	-0.6074546850	0.6607
Texas	2.5762841733	-0.4460943330	0.6959

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATORS SURVEY
GVFs FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-squared
Utah	3.3678898882	-0.6105771510	0.7069
Vermont	3.1413122920	-0.4523973770	0.7524
Virginia	2.8557587508	-0.4009441660	0.7187
Washington	3.0338893300	-0.5523654680	0.6417
West Virginia	3.0635873597	-0.5131227540	0.8128
Wisconsin	2.7078225328	-0.4671289050	0.7785
Wyoming	3.2952702719	-0.5790503010	0.8131
SECTOR/REGION			
Public/Northeast	1.8745423099	-0.4963771780	0.7399
Public/North Central	1.8568600969	-0.6308223880	0.7191
Public/South	1.6066250274	-0.5656850230	0.8347
Public/West	1.9189886111	-0.5834345870	0.8695
Private/Northeast	2.4977187085	-0.4281858500	0.7486
Private/North Central	2.4360594469	-0.6132462910	0.7727
Private/South	2.7912468286	-0.5097588680	0.5541
Private/West	2.5984918923	-0.3773258390	0.5323
SECTOR/SCHOOL LEVEL			
Public Elementary	1.4308973573	-0.5475057650	0.6116

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE SCHOOL ADMINISTRATORS SURVEY
GVFs FOR AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-squared
Public Secondary	1.5998425789	-0.5281493790	0.8216
Public Combined	2.0567561140	-0.5411671440	0.7571
Private Elementary	2.2096139719	-0.5500145920	0.8740
Private Secondary	2.9174982415	-0.4762848520	0.6758
Private Combined	2.4277149587	-0.4015305550	0.7985

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY

GVFs FOR TEACHER PERCENTAGES

THE TEACHER SURVEY
GVFs FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
SECTOR			
Public	-0.5184	52.0630	0.8226
Private	-5.2746	525.7679	0.7568
SECTOR/REGION			
Region Northeast	-2.3046	231.4202	0.8523
Region North Central	-1.8418	184.8761	0.8010
Region South	-1.4815	148.7845	0.8579
Region West	-2.7448	275.0578	0.7625
STATE			
Alabama	-24.1824	2420.3027	0.6752
Alaska	-68.4483	6837.4775	0.7115
Arizona	-56.4025	5802.5403	0.5215
Arkansas	-24.0938	2635.1449	0.6625
California	-6.9750	699.5611	0.7965
Colorado	-21.5264	2164.0534	0.8757
Connecticut	-21.5549	2129.7371	0.9075
Delaware	-45.7507	4623.6498	0.8253
D.C.	64.4499	4020.3991	0.5569
Florida	-16.4259	1644.1194	0.7720

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVFs FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	-17.7130	1841.7884	0.7685
Hawaii	-52.4829	5213.5891	0.8836
Idaho	-32.6529	3258.7801	0.7860
Illinois	-9.9668	1013.5590	0.7776
Indiana	-17.2616	1736.3838	0.7921
Iowa	-23.1060	2322.9068	0.8413
Kansas	-35.5555	3459.1376	0.6461
Kentucky	-28.3262	2843.1514	0.7439
Louisiana	-23.0712	2345.4476	0.8674
Maine	-42.1763	4130.6762	0.8211
Maryland	-36.7117	3646.0399	0.8364
Massachusetts	-15.8728	1584.5218	0.7989
Michigan	-17.5359	1763.8882	0.8107
Minnesota	-8.2671	1690.7118	0.7098
Mississippi	-20.7021	2099.3470	0.7825
Missouri	-20.2754	2040.2089	0.7858
Montana	-30.9820	3102.4598	0.7732
Nebraska	-32.3077	3185.4637	0.7142
Nevada	-43.5440	4365.9970	0.8607

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVFs FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	-64.9472	6399.6830	0.6399
New Jersey	-16.1289	1609.0576	0.7932
New Mexico	-36.7558	3548.4687	0.8419
New York	-7.7843	782.5519	0.8445
North Carolina	-19.8402	1988.5138	0.7583
North Dakota	-21.7629	3119.0900	0.7606
Ohio	-11.4548	1150.0153	0.7453
Oklahoma	-21.6702	2117.8027	0.6817
Oregon	-25.8591	2598.2027	0.8665
Pennsylvania	-13.0010	1305.3994	0.7221
Rhode Island	-42.8821	4328.9158	0.9676
South Carolina	-36.7319	3633.4160	0.8093
South Dakota	-39.3791	3953.3006	0.8022
Tennessee	-26.0080	2605.2693	0.7180
Texas	-8.2014	823.5786	0.8127
Utah	-35.1034	3499.1212	0.7676
Vermont	-65.8240	6542.0548	0.7023
Virginia	-17.3291	1752.1302	0.8740
Washington	-23.4090	2338.4625	0.8043

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVFs FOR PERCENTAGES

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
West Virginia	-32.5558	3172.9270	0.8253
Wisconsin	-20.8268	2086.9444	0.6995
Wyoming	-42.5473	4227.5317	0.7878
SECTOR/REGION			
Public/Northeast	-2.3855	239.6002	0.8940
Public/North Central	-2.0492	205.8896	0.8064
Public/South	-7.5621	-38.5412	
Public/West	-3.0689	308.8133	0.7854
Private/Northeast	-3.9887	1263.3187	0.4397
Private/North Central	-12.7412	1291.1508	0.8886
Private/South	-17.3097	1709.6549	0.9099
Private/West	-22.7047	2241.6540	0.9275
SECTOR/MINORITY STATUS			
Private Min <.2	-0.5183	51.3437	0.7564
Public Min <.2	-5.1485	518.9656	0.7777

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY

GVFs FOR TEACHER TOTALS

THE TEACHER SURVEY
GVF'S FOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
SECTOR			
Public	0.1801	1092211.9452	0.7061
Private	8.7154	1100451.7728	0.7225
REGION			
Region Northeast	0.6142	1141046.6766	0.8049
Region North Central	0.7640	1072664.3780	0.6695
Region South	0.4379	1163981.2967	0.7939
Region West	0.7596	1159770.0089	0.6446
STATES			
Alabama	2.1310	828222.1953	0.5648
Alaska	18.3953	353869.6136	0.5811
Arizona	72.6330	1274530.1556	0.2629
Arkansas	7.2029	847450.1392	0.6392
California	1.7407	1343523.7359	0.6981
Colorado	14.7912	560322.0373	0.7483
Connecticut	7.6556	764747.8169	0.8430
Delaware	3.2134	273295.8796	0.7629
D.C.	78.3865	296336.5230	0.6161
Florida	7.2383	1278717.2169	0.6367

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVF'S FOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	2.5995	1187003.8179	0.7521
Hawaii	18.6816	571503.8016	0.8408
Idaho	12.3576	280615.3084	0.7444
Illinois	6.8519	1005173.6312	0.6268
Indiana	1.9676	961229.6881	0.6676
Iowa	23.7717	741245.8711	0.6815
Kansas	23.4180	850101.3922	0.4086
Kentucky	1.5158	1002303.7720	0.6847
Louisiana	1.5422	1018819.2012	0.8452
Maine	5.1037	568185.5348	0.7838
Maryland	89.8680	1564660.4076	0.5939
Massachusetts	3.9017	1008749.3950	0.7691
Michigan	-0.0214	1405075.4571	0.7834
Minnesota	2.1128	863530.4383	0.7841
Mississippi	2.7473	598523.5648	0.6759
Missouri	1.5828	1013018.1552	0.7158
Montana	7.4187	389558.5015	0.7055
Nebraska	38.1799	548003.0308	0.5493
Nevada	22.9142	301305.0147	0.7134

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVF'S FOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Hampshire	49.5022	491711.6123	0.6652
New Jersey	4.3560	1273613.0914	0.6425
New Mexico	10.0199	493106.6461	0.8104
New York	5.2067	1207589.2114	0.7527
North Carolina	-0.3543	999364.9870	0.7202
North Dakota	6.3108	293613.6422	0.7878
Ohio	1.6847	1205160.5398	0.6588
Oklahoma	9.7656	798045.5069	0.5338
Oregon	1.6695	588151.9516	0.8066
Pennsylvania	3.7281	1283015.9775	0.5919
Rhode Island	26.5160	362598.2659	0.9152
South Carolina	-1.0880	1198468.5003	0.7813
South Dakota	19.2182	279946.5013	0.7590
Tennessee	7.5420	1014267.5746	0.5932
Texas	5.0237	1212960.1457	0.7038
Utah	2.6275	489416.4795	0.7076
Vermont	4.3725	428965.1024	0.6321
Virginia	13.0708	918027.7266	0.7662
Washington	6.0700	857498.6797	0.6164

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

THE TEACHER SURVEY
GVF'S FOR TOTALS

Best GVF was Model 1: $CV = \sqrt{A + B/X}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
West Virginia	-0.0055	629391.6456	0.7856
Wisconsin	5.8393	1096591.6565	0.5935
Wyoming	1.9156	236178.8644	0.7590
SECTOR/REGION			
Public/Region NE	0.5838	971798.0441	0.8533
Public/Region NC	0.6995	1034950.8050	0.7031
Public/Region South	0.0954	1020757.5677	0.8229
Public/Region West	0.3723	1213592.5645	0.7185
Private/Region NE	32.4142	848836.2308	0.4503
Private/Region NC	9.5088	895913.9549	0.8769
Private/Region South	51.7136	1137260.1361	0.8479
Private/Region West	24.1329	771258.8738	0.8707
SECTOR/MINORITY STATUS			
Private Min <.2	0.1801	1092211.9452	0.7623
Public Min <.2	8.7154	1100451.7728	0.7604

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

GVFs FOR SALARY AVERAGES

GVFs FOR SALARY AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	**R-Squared**
SECTOR			
Public	6.9873209480	-0.8339531989	0.7536
Private	9.2437677020	-0.9417982250	0.8124
REGION			
North East	4.8720023452	-0.4282891780	0.5416
North Central	6.6196028540	-0.6730394140	0.6943
South	5.4663879161	-0.5310647390	0.5707
West	6.6973559911	-0.6599684950	0.6367
STATE			
Alabama	9.5058498267	-0.8567922220	0.6390
Alaska	8.5684225049	-0.6319883150	0.6303
Arizona	7.9675540264	-0.6971414960	0.6539
Arkansas	10.3575737100	-0.9673343710	0.7247
California	6.6619268648	-0.6126921880	0.6375
Colorado	9.9112896277	-0.8683559840	0.6856
Connecticut	8.0294625422	-0.6845515910	0.7023
Delaware	9.3365359830	-0.8183202650	0.5626
D.C.	7.8874819021	-0.6719790490	0.7031
Florida	5.1159960926	-0.3698623270	0.3481

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

GVFs FOR SALARY AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
Georgia	6.0513931875	-0.4675665150	0.4588
Hawaii	9.0792211449	-0.7801717720	0.7679
Idaho	5.3035198993	-0.3234631480	0.2886
Illinois	6.2133604186	-0.5179448470	0.5763
Indiana	7.7786193168	-0.7168088540	0.7123
Iowa	9.0675618440	-0.8696834660	0.8269
Kansas	8.2684675633	-0.7381357310	0.6170
Kentucky	6.5628362362	-0.4659299090	0.4174
Louisiana	10.8413665520	-1.0127026580	0.6556
Maine	8.7746698606	-0.7984112060	0.7089
Maryland	6.8608914019	-0.5770653600	0.7935
Massachusetts	8.7838271609	-0.8178919820	0.7409
Michigan	8.3935372188	-0.7614542600	0.7344
Minnesota	7.7336112351	-0.6818819890	0.6535
Mississippi	11.0563312690	-1.0439094030	0.5818
Missouri	11.8158681720	-1.1388023310	0.6423
Montana	8.8647819574	-0.7685735770	0.5264
Nebraska	7.3665159639	-0.6495819200	0.4569
Nevada	6.7861959094	-0.5022049370	0.5492
New Hampshire	8.4418374904	-0.6929081790	0.6410

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

GVFs FOR SALARY AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ lnX)}$

	PARAMETERS		MEASURE OF FIT
GROUP	A	B	R-Squared
New Jersey	8.1247730987	-0.7570404660	0.7089
New Mexico	8.1435392294	-0.6686123550	0.6111
New York	7.5161508509	-0.6971818700	0.7525
North Carolina	8.7464925824	-0.7935385980	0.6820
North Dakota	10.5392551450	-0.9899540500	0.8202
Ohio	7.0509796762	-0.6073612350	0.6391
Oklahoma	9.3158316339	-0.8764048730	0.7268
Oregon	9.1029944633	-0.8136558510	0.5426
Pennsylvania	6.4216717780	-0.5099405870	0.4577
Rhode Island	9.1938901562	-0.8189889450	0.6466
South Carolina	7.1942673611	-0.5223304400	0.4533
South Dakota	9.8160669476	-0.9479172380	0.8751
Tennessee	9.4356905736	-0.8347848170	0.6553
Texas	6.5324201173	-0.5665282800	0.4600
Utah	5.4224086805	-0.4087039790	0.2621
Vermont	9.9992758139	-0.9250337800	0.6615
Virginia	3.4395350214	-0.0901035000	0.0417
Washington	8.7621822087	-0.7883480470	0.6651
West Virginia	10.3514207250	-0.9316306560	0.6386
Wisconsin	8.8398024855	-0.8412887470	0.6884

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

GVFs FOR SALARY AVERAGES

Best GVF was Model 3: $CV = \sqrt{\exp(A + B \ln X)}$

	PARAMETERS		MEASURE OF FIT
GROUP	**A**	**B**	R-Squared
Wyoming	9.2895073205	-0.8100496530	0.7449
SECTOR/REGION			
Public/North East	7.3680433407	-0.7658250120	0.7108
Public/North Central	8.2619465140	-0.8830234090	0.7326
Public/South	9.5883398180	-1.0648451570	0.7555
Public/West	7.6509431779	-0.7705887470	0.6068
Private/North East	9.8745199364	-0.9150857760	0.6541
Private/North Central	9.6722571420	-0.9414123080	0.8221
Private/South	9.1242689461	-0.8450203420	0.8408
Private/West	9.0407215487	-0.8442335060	0.8701
SECTOR/MINORITY ENROLLMENT			
Public Min <.2	9.2437677040	-0.9417982250	0.7348
Public Min >.2	-6.9609766840	0.6941279990	0.8205
Private Min <.2	9.2437677040	-0.9417982250	0.8169

* Groups with an asterisk represent results from the weighted analysis because the iteratively reweighted analysis did not converge.

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